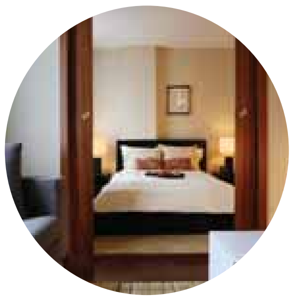
KEEPING WATCH ON THE WORLD'S VOLCANOES

ICAO JOURNAL

VOLUME 62 NUMBER 3, 2007

MULTI-CREW PILOT LICENCE

INNOVATIVE AB INITIO TRAINING FOR THE AIRLINE PILOT



ICAO Journal

The magazine of the International Civil Aviation Organization

VOL. 62, NO. 3 **MAY/JUNE 2007**

FEATURES

UPDATE

COVER *(Photo by Rosa Bremmer/LuckyOliver photos)*
The nature of the multi-crew pilot licence that was introduced late last year is not clearly understood throughout the aviation community, in part because of inaccurate statements about the newly created licence that have appeared in media reports. The article beginning on page 15 presents some important facts about this innovative new training initiative.

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Promoting the Development of International Civil Aviation

The International Civil Aviation Organization, created in 1944 to promote the safe and orderly development of civil aviation worldwide, is a specialized agency of the United Nations. Headquartered in Montreal, ICAO develops international air transport standards and regulations and serves as the medium for cooperation in all fields of civil aviation among its 190 Contracting States.

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ICAO Journal

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THE OBJECTIVES of the Journal are to provide a concise account of the activities of the International Civil Aviation Organization and to feature additional information of interest to ICAO Contracting States and the international aeronautical world.

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Published in Montreal, Canada. Second class mail registration No. 1610. ISSN 1014-8876. Date of publication of Issue 3/2007: 12 July 2007. Published six times annually in English, French and Spanish.

PRINT SUBSCRIPTIONS: $40 per year (Order No. 3101-A). Single copies available for $10 (Order No. 310019). Prices in U.S. funds. ***For subscription and circulation inquiries***, please contact ICAO Document Sales Unit. Telephone: +1 (514) 954-8022; Facsimile: +1 (514) 954-6769; E-mail: sales@icao.int. ***Important Note:*** The current issue may be viewed in PDF format without delay at ICAO's website (http://icao.int/icao/en/jr/jr.cfm). Issues dated 2005 or earlier are viewable using the downloadable DjVu reader. Planned publication dates for 2007 are 16 February, 23 April, 15 June, 13 August, 14 September and 20 December.

E-SUBSCRIPTIONS: Readers are invited to register at ICAO's website to receive an e-mail alert as soon as each issue of the Journal becomes available online. To register for this free service, please visit www.icao.int/icao/en/jr/subscribe.cfm

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GRAPHIC ART/DESIGN: Bang Marketing (www.bang-marketing.com).

PRINTING: Transcontinental-O'Keefe (www.transcontinental-printing.com).

ICAO HEADQUARTERS: 999 University St., Montreal, Quebec, Canada H3C 5H7. Telephone +1 (514) 954-8219; Facsimile +1 (514) 954-6077; e-mail: icaohq@icao.int.

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PERFORMANCE INDICATORS

THE GROWTH of airline passenger and freight traffic in the Asia/Pacific region has been the fastest in the world over the past two decades, and this trend is expected to continue for the next 20 years. According to the latest ICAO forecasts, passenger-kilometres and freight tonne-kilometres for airlines of the region will increase at an average annual rate of 5.8 percent and 8 percent, respectively.

While most of the past growth has been driven by the newly industrialized countries of the region, future growth will be determined by developments in China and India, whose combined traffic currently represents around 6 percent of the world's air traffic, both in terms of tonne-kilometres and passenger-kilometres performed, and about 25 percent of regional traffic (all statistics concerning China exclude Hong Kong and Macao Special Administrative Regions).

Over the past five years, the average traffic growth of airlines based in these two countries has far outpaced that of the world's average growth. Both countries and their airlines have put in place aggressive plans to cope with the dramatic growth, with multi-billion dollar airport projects and orders for new aircraft totalling more than 1,000 jets to be delivered over the next five years.

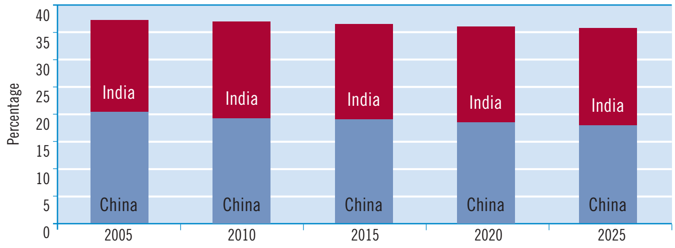
The rankings of the two countries, in terms of passenger volume, is shown in the adjacent table. With strong projected gross domestic product (GDP) growth rates and rising per capita incomes, most forecasts for China and India call for an average annual growth rate of around 8 percent or higher over the next two decades.

The predicted total investment in airport construction in China is estimated at 150 billion yuan (U.S. $18 billion) for the construction of more than 40 new airports by 2010. There are some 690 aircraft on the order book, with deliveries scheduled to the year 2013. China already ranks second in the world for civil air traffic, both in terms of tonne-kilometres and passenger-kilometres performed.

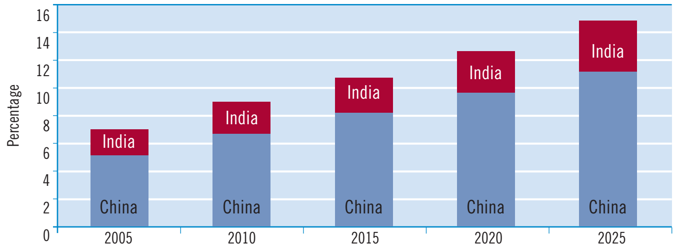
India's air carriers have ordered around 430 new aircraft that are scheduled to enter service with existing airlines in a phased manner by 2012-13. India's airline industry is expected to show very strong growth rates over the next few years, with domestic traffic outpacing a respectable increase in international traffic. Based on conservative estimates, the country is expected to move up to around 8th place for total traffic (i.e. domestic plus international) by 2012, and to around 4th spot in terms of domestic traffic volume by around 2010.

Passenger Traffic	Total		Domestic	
	2006	2005	2006	2005
China	158 million	137 million	144 million	125 million
Rank	2	2	2	2
India	40 million	28 million	33 million	22 million
Rank	12	15	7	11

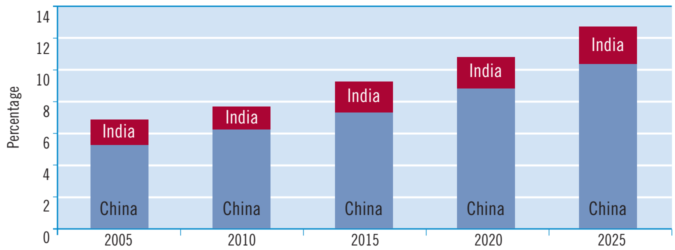
Passenger traffic and world rank, 2006 and 2005



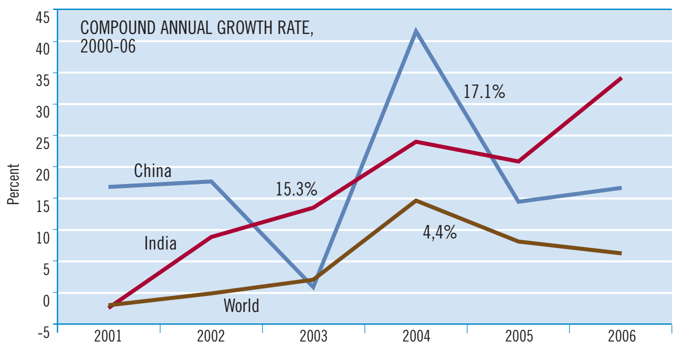
Share of the world population accounted for by China and India



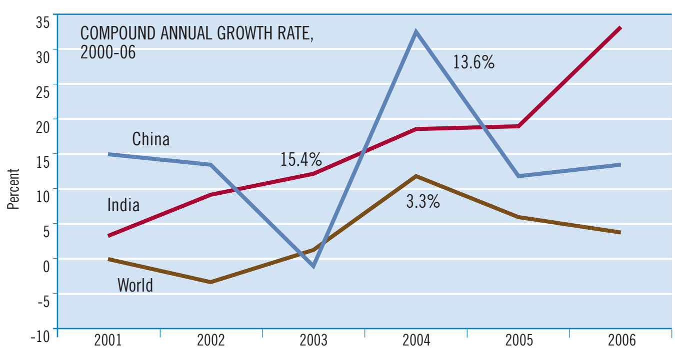
Share of world GDP generated by China and India



Share of world air traffic accounted for by China and India



Percentage change in total scheduled traffic (total passenger-km)



Percentage change in total capacity (available seat-km)

Volcanic ash advisory centre highlights ways to optimize procedures

One possibility for improving the effectiveness of volcanic ash advisories is to develop, as the Buenos Aires centre has done, a capability for the early detection of volcanic activity by using a satellite-based system that automatically generates alerts

GUSTAVO ALBERTO FLORES
BUENOS AIRES VOLCANIC ASH ADVISORY CENTRE (ARGENTINA)

EARLY in-flight encounters with volcanic ash clouds demonstrated the need to establish an independent system — one intended specifically for aviation safety — to keep watch on the more than 600 volcanoes around the world that are known to be active. Such monitoring is necessary because of the harm that volcanic ash poses to aviation operations. One oft-cited encounter involved a British Airways Boeing 747 which lost power on all four engines after they ingested ash from Mt. Galunggung, in Indonesia. The B747 descended to 12,000 feet before its crew could restart the engines and proceed to an emergency landing in Jakarta.

The establishment of a global volcanic ash monitoring and warning system based on existing observing networks dates back to the early 1980s. The initiative was spearheaded by the ICAO Volcanic Ash Warnings Study Group (VAWSG), and later the International Airways Volcano Watch Operations Group (IAVWOPSG).

Efforts by these experts led to the introduction of IAVW-related provisions in relevant regulatory documents. These provisions concern ground-based and aircraft observations of volcanic eruptions and ash clouds as well as satellite detection and monitoring of volcanic ash and, to a lesser extent, the monitoring of volcanic eruptions by a network of volcanic ash advisory centres (VAACs). The provisions also cover how VAAC information is reported, and to whom.

Jim Jorgenson

Since ash clouds can travel to areas far from their source, flight crews need precise and timely information about their dispersion

Primary functions

A VAAC is a regional meteorological centre designated by an air navigation agreement to provide advisories. The advisory information on the extent and forecast movement of volcanic ash in the atmosphere is communicated to various aviation-related facilities including meteorological watch offices (MWOs), area control centres (ACCs), flight information centres (FICs), world area forecast centres (WAFCs) and international operational meteorological (OPMET) data banks.

These various facilities are notified whenever a volcano has erupted or is expected to do so, or whenever volcanic ash is reported in a VAAC's area of responsibility. The VAAC performs its primary task by monitoring relevant geostationary and polar-orbiting satellite data to detect the existence and extent of volcanic ash in the atmosphere, and by using transport and dispersion models to predict the movement of an ash cloud.

Forecasts on the extent and movement of volcanic ash cloud are issued every six hours to the offices and centres cited above, as well as to relevant regional area forecast centres. The six-hour bulletins continue until such time as the volcanic ash cloud is no longer identifiable from satellite data and, moreover, there are no further reports of volcanic ash or additional eruptions.

There are currently nine ICAO-designated VAACs around the world, including the VAAC located at Buenos Aires, whose activities are the focus of this article. The other centres are located in Anchorage, Darwin, London, Montreal, Tokyo, Toulouse, Washington, D.C. and Wellington.

Buenos Aires VAAC. Like all VAACs, the Buenos Aires centre — which entered operation only last year — has been assigned an area of responsibility. This extends from latitude 10 to 90 degrees south, and from 30 to 90 degrees longitude west. The area includes a sector of the Andean Cordillera where approximately 100 active volcanoes have been identified, of which more than 20 are classified as high risk.

The volcanoes found in this sector of the cordillera are predominantly characterized by violent and sudden expulsion of volcanic ash, which is comprised of finely pulverized rock. Carried aloft, this ash can be dispersed over great distances and can reach heights beyond the tropopause. When it falls to the ground, it can have catastrophic consequences that must be handled by emergency management organizations whose operations may require substantial funding, as was the case with the eruption of Mt. Hudson in August 1991.

Remote Sensing Monitoring. Meteorological satellites are used to monitor potentially active volcanoes. The VAAC also carries out post-eruption monitoring, and observes the successive positions of volcanic ash clouds using direct images or algorithms which highlight volcanic ash when the satellite view is obstructed by steam clouds.

To support its remote sensing activities, the National Meteorological Service of Argentina that hosts the Buenos Aires VAAC arranged with the National Space Activities Commission of Argentina (CONAE) to develop a satellite sensing system for the early detection of volcanic activity. This system consists essentially of the automatic execution of an algorithm for detecting hot spot-related anomalies and their association to a volcano within a radius of five kilometres.

Whenever there is cause for concern, the CONAE system issues an automatic advance alert notice to a predetermined and restricted list of correspondents. This notice indicates the name of the volcano in question, the time at which the anomaly was recorded, and the characteristics of the anomaly. The alert is transmitted to cellular telephones as an e-mail text message.

Once such an alert has been dispatched, another CONAE application generates sector-by-sector imagery of the area surrounding the anomaly based on the sensor data. This graphic information is also sent automatically to authorities by e-mail.

The system also analyses and determines which upcoming satellite overflights can provide information of greater resolution. It programmes the capture of these data and pinpoints the location of the anomaly in order to support monitoring, analysis and decision-making.

As these volcanic activity reports occur only occasionally, the CONAE system issues a daily report on a designated significant point, such as an oil company gas vent or flaring tower, to demonstrate to operators that the system remains active.

Sigurleifur Kristjánsson

Volcanic ash advisory centres keep watch on more than 600 active volcanoes around the world because of the harm that volcanic ash poses to aviation operations

Regional services. As with other VAACs, the Buenos Aires centre incorporates a specialized regional meteorological centre (CMRE). It is responsible for various tasks, which are described briefly below.

Through the VAAC's communications section, the specialized regional meteorological centre receives warnings on incipient volcanic activity. Together with the centre's remote sensing personnel, the CMRE analyses satellite images. In order to confirm whether the forecast ash cloud trajectory agrees with the trajectory obtained from the volcanic ash forecast transport and dispersion (VAFTAD) model, the results of the dispersion model are compared with the successive satellite imagery.

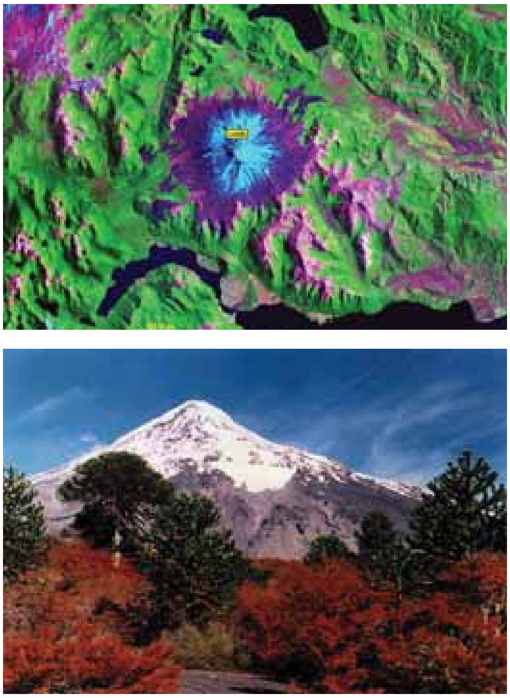
The CMRE determines when to initiate the volcanic ash "Alert Phase," at which point volcanic ash advisories are prepared and distributed throughout the region and internationally in accordance with the established standards and procedures. It also determines when to initiate the "All-Clear Phase." The VAAC's operational tasks are suspended whenever the volcanic ash cloud is no longer identifiable and the reporting of ash clouds and eruptions have ceased.

Following any episode of volcanic activity, the CMRE analyses the weaknesses and strengths of the established procedures, and proposes suggested changes, if necessary.

Room for improvement

The Buenos Aires VAAC is currently focused on optimizing its operational procedures, and has made a number of proposals in this respect. For example, the Buenos Aires centre has recommended to the States associated with its area of responsibility that they sign formal agreements to foster cooperation and coordination between their MET offices as well as operational units providing aeronautical information services (AIS) and air traffic services (ATS), vulcanology agencies, and airlines. Formal agreements would help ensure the timely exchange of information and would also better support decision-making about the safe use of airspace.

The VAAC wish list cites several potential improvements. It points out, for example, that volcanic ash SIGMETs and forecasts could be better prepared and distributed by following ICAO guidelines, and recommends harmonizing the colour coding used by vulcanological organizations and the International Air Transport Association (IATA) to signify the level of volcanic ash alert. It proposes the updating of each State's contact list and operational procedures to ensure the speedy dissemination of alerts, noting that it is crucial that such listings provide contact information for offices and units that remain operational around the clock. The VAAC also called for periodic exercises entailing the exchange of volcanic ash cloud information (such an exercise was conducted by the Buenos Aires VAAC in coordination with the Washington VAAC in November 2006).



Satellite image (top) and photo of Mt. Lanin, a potentially active volcano in the Argentine Andes

The VAAC has also proposed the creation of a guide on preparing airport emergency plans for responding to the disruption of operations caused by the dispersion of volcanic ash. A draft guide on volcanic ash emergency planning is to be discussed by regional air navigation planners at a future meeting.

Future projects. The Buenos Aires VAAC has a number of projects under development. Notable among these is a plan to expand the VAAC's current remote sensing system for the early detection of volcanic activity to include automatic detection of indicators such as the presence of sulphur dioxide or portions of the atmosphere contaminated by high levels of volcanic ash. This project was to have been completed by the end of 2006, but remains in the development phase because of its complexity and the large number of variables to consider.

Another important project is the creation of training modules for the various sections of the VAAC (i.e. the individual sections of the VAAC responsible for remote sensing monitoring, communications, specialized regional meteorological services, and administrative support). In creating such modules, certain factors that hinder the training process have to be taken into consideration. These include the lack of personnel in the area of specialization, a situation that often makes it impractical to relieve operating personnel of their regular duties; scarce economic resources, often making it hard for employers to cover the cost of transportation, accommodation, etc.; a lack of suitable training centres; and a lack of training policies that make it difficult to establish career objectives.

To address training issues, Argentina has devised a plan for training aviation personnel that it is currently implementing nationwide, and is encouraging other States to introduce a similar plan on a regional level. Such action is focused on developing an accurate report on the status of operating personnel, making it possible for the training process to address actual common needs.

In brief, the Argentine plan consists of several steps, beginning with a survey of the course certificates held by personnel. Subsequent steps involve establishing the desirable knowledge profiles, developing the standards for the granting of certificates of competence, and standardizing operational procedures. Advanced steps include the identification of methods for updating operational procedures, the definition of a legal framework for standardizing operational procedures and, finally, the dissemination of operational procedures to personnel. As a last step, the plan also provides for continuous distance training.

Summary

When an episode of volcanic activity takes place, the ash clouds emitted can affect vast areas. Carried by winds aloft, ash clouds can travel to areas that are very far from their source. This is why flight crews need precise and timely information about ash cloud dispersion. Such information makes it possible for operators to plan safe alternative routes in an orderly manner, which may require complex coordination by ATS units.

Flight crews have a pivotal safety role to play. When aircraft inadvertently fly through or near to this hazard, their crews must, with the utmost dispatch, notify ATS units of the occurrence so that alternative routings can be identified with support from the VAACs.

In establishing operating procedures, State civil aviation administrations, air carriers and meteorological authorities must jointly address the issues related to volcanic ash emission. These operating procedures should be periodically reviewed to ensure harmonization with ICAO standards and recommended practices and guidance material such as the *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Document 9691) and the *Handbook on the International Airways Volcano Watch* (Document 9766).

It should be borne firmly in mind that when a hazard of this type occurs, it is crucial that all parties are fully aware of their respective roles. In this way, advisories may be issued as promptly as possible with the purpose of minimizing the event's effect on operations, particularly with respect to safety, and without overlooking the adverse economic impact that can result from the dispersal of volcanic ash. □

Mr. Flores is the Operational Supervisor at the Buenos Aires Volcanic Ash Advisory Centre. He is a member of the ICAO International Airways Volcano Watch Operations Group (IAVWOPSG).

Meteorological agency focused on improving aviation weather services in Dar es Salaam FIR

To keep pace with demand for its services, the meteorological agency in Tanzania has recently acquired contemporary forecasting workstations and deployed automatic weather observing systems at major airports, and is now focused on providing additional staff training and achieving full cost recovery

M.S. Mhita
P.F. Tibaijuka • A.J. Mlaki
Tanzania Meteorological Agency

THE growing availability of affordable air travel throughout the world has considerably widened aviation's role in creating wealth in the developed countries, but has also brought enormous benefits to developing economies by unlocking their potential for trade and tourism.

In Tanzania, for example, the liberalization of air transport, together with economic growth in sectors such as mining and tourism, have contributed significantly to the rapid growth of air transport in recent years. The number of local and international airlines operating in the country has increased dramatically, with flight movements rising from 115,636 in 2001 to over 155,000 in 2005, an average annual change of 8.5 percent. At the same time, the number of domestic and international airline passengers in Tanzania almost doubled, climbing to 2.17 million in 2005 from 1.27 million four years previously. In other words, the average annual growth in passenger volume exceeded 17 percent during the four-year period.

The safe and efficient operation of aviation is dependent on the availability of timely and reliable weather information. Given the possible range of severe weather that may be encountered in tropical Africa, high quality weather services using the latest technology are important to the full spectrum of air carriers, from operators of light aeroplanes employed on rural services to wide-body transports serving intercontinental routes. All of this makes aviation weather forecasting in Tanzania, and indeed all of Africa, an immense challenge. One of the key players in meeting aviation's weather information needs is the Tanzania Meteorological Agency (TMA).

Aeronautical meteorological services. According to international provisions for air navigation, TMA has the responsibility of providing meteorological forecasts, weather-watch and en-route services at all civil aerodromes in the Dar es Salaam flight information region (FIR), in addition to its national responsibility for providing meteorological information at military aerodromes.

The meteorological personnel stationed at the country's three international airports of Nyerere (Dar es Salaam), Kilimanjaro and Zanzibar, as well as those at 11 other aerodromes scattered throughout the country, make the hourly meteorological (METAR) reports and transmit this information to the air traffic services (ATS) units and to the Central Forecast Office located in Dar es Salaam, where they are exchanged locally, regionally and internationally via the ICAO aeronautical fixed telecommunication network (AFTN).

Charles J. Sharp

View of Mt. Kilimanjaro from a high flying airliner. Given the possible range of severe weather that may be encountered in tropical Africa, high quality weather services using the latest technology are important to the full spectrum of air carriers.

During the past decade, the global aviation industry has witnessed rapid advances in science and technology. This has necessitated the commissioning of new facilities and created a need for staff to be properly trained to operate and maintain up-to-date systems. While certainly beneficial, such advances have also had a significant implication for the funding of national meteorological services in developing countries, especially in Africa. Considering the possible impacts of the current and future economic, scientific and technological environment on the provision of meteorological services, it is hoped that users will understand and support the collaborative spirit that service providers must adopt to effectively address the impact of such changes.

The aviation industry requires maintenance of high standards of service in the interest of flight safety. With respect to aeronautical meteorology, this requires implementation of the standards and recommended practices developed by ICAO. Important aspects requiring compliance with ICAO and World Meteorological Organization (WMO) regulations include the qualifications and experience of staff, quality management of instruments and equipment, and infrastructure and service provision.

As a semi-autonomous entity, the TMA is partly funded by the Government of Tanzania. Importantly, it is also partly self-financing, meeting its operational costs through the levying of charges on its clients in accordance with ICAO's guidelines on cost recovery. (TMA has also developed a charging system for specialized, non-aviation meteorological services which takes into account the type of data or information produced, the labour involved, etc.) Furthermore, the agency is required to manage its affairs in a businesslike, cost-effective manner conforming with modern management practices and techniques, and in particular to apply the highest standards of financial management and accounting to its operations.

Like most aeronautical meteorological offices in Africa, Tanzania makes use of the world area forecast system (WAFS) products obtained through the satellite distribution system for information relating to air navigation (SADIS). WAFS products are supplied by the world area forecast centre (WAFC) in London and from the meteorological data dissemination (MDD) service or from data obtained from advanced centres via the Internet. The TMA also has an FTP address for accessing SADIS products. A few countries on the continent have developed their own local numerical weather prediction products. Occasionally, products from the European Centre for Medium Range Weather Forecasts (ECMWF) are used for routine weather forecasting, as well as for deriving aviation weather products.

Tanzania has acquired two modern interactive forecasting workstations from the U.K. Met Office (HORACE) and from Météo France (SYNERGIE). High level aircraft cruising above flight level (FL) 240 are still served with WAFS products for significant weather charts and upper-level winds and temperatures, while aircraft operating below FL240 are currently served with products generated locally using numerical weather predictions created by the HORACE and SYNERGIE workstations.

TMA also runs its own numerical weather prediction limited area model (WRF), which supports forecasts that are valid for periods ranging from six to 48 hours. Low level significant weather charts are produced twice daily for FL100 and FL180.

Latest service improvements. In its endeavour to improve on services to the aviation industry, TMA has upgraded observations in the terminal areas by deploying automatic weather observing systems (AWOS). So far these automated systems have been installed at Nyerere and Kilimanjaro international airports, where they have greatly improved both observational data and terminal aerodrome forecasts (TAFs).

TMA offers meteorological briefings at all three international airports and three other major airports, displaying significant weather charts, upper-level winds and temperature, and satellite imagery, as well providing oral presentations to aircraft operators and flight crews. Internet connections are available at 12 airports to provide access to aviation and other meteorological information generated by the Central Forecasting Office. Hourly METARs from all local stations are distributed to the 12 airports using the Internet.

Cost recovery. In addressing cost recovery for airports and air navigation services (ANS), the chief executives of the three key players, namely, the Tanzania Airports Authority, the Tanzania Civil Aviation Authority and the Tanzania Meteorological Agency, are all of the opinion that the revenue recovered by all three agencies does not reflect the actual cost of providing the services.

A tripartite committee involving the above-cited institutions was formed in 1999 to determine the cost of providing aeronautical services and propose the appropriate methodology for implementing air navigation charges, including their collection and equitable allocation among the three organizations. The terms of reference called for the committee to determine relevant cost centres, identify activities and tasks attributable to aeronautical costs, and perform a cost analysis. The committee was also asked to estimate future costs based on projected aviation traffic.

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Multilateration technology is well suited to a wide range of applications

Best known perhaps for its surveillance capabilities and role in facilitating transition to a full ADS-B environment, multilateration technology can be used effectively in multiple ways, including the automation of an airport's billing system

ALEX SMITH • RUSSELL HULSTROM
ERA CORPORATION
(UNITED STATES)

IT is not surprising that automatic dependent surveillance-broadcast (ADS-B) is poised to become a key element of the world's future air traffic management (ATM) system. Its benefits are now well understood, both by operators and air navigation service providers (ANSPs). Not only does ADS-B enhance safety while increasing capacity and efficiency, it also promises substantial cost savings. In announcing its ADS-B programme last year, for example, the U.S. Federal Aviation Administration (FAA) stated that it would permit the eventual decommissioning of much of the country's secondary surveillance radar (SSR) network, thereby saving about U.S. $1 billion. Airservices Australia launched a similar programme in 2005, and it too expects significant savings when use of ADS-B reaches the point where its SSR network can be safely retired.

Perhaps less well known is the fact that a number of ANSPs are already moving to a new surveillance technology which provides equivalent and often better performance than the traditional SSR, at a much lower acquisition and maintenance cost. But even more important is the fact that this technology, known as multilateration, can provide ANSPs with an economical foundation for their eventual transition to a full ADS-B environment.

In its surveillance role, multilateration does away with the need for expensive rotating radar antennas, replacing SSRs with several small and inexpensive stations strategically located to cover the same or greater airspace volume. Each unmanned station acts as a passive "listening post," instantaneously receiving every aircraft transponder transmission within line-of-sight range, out to the highest jet altitudes. One or more multilateration stations can be combined active/passive units, both transmitting transponder interrogation signals identical to an SSR and then listening to their responses. Multilateration stations can receive all transponder responses (i.e. basic Mode-A/C, Mode-S, military IFF and ADS-B).

When incoming transponder signals are received by these stations, each immediately transfers its data to a centrally located processing unit the size of a filing cabinet, where advanced signal time-of-arrival and triangulation techniques are applied to determine the precise position of each aircraft. These are then passed to the air traffic control (ATC) centre using standard protocols, including all the data normally provided by an SSR. However, the multilateration process is much faster, allowing controllers to track traffic every second, compared to viewing targets with each sweep of an SSR's rotating antenna. The frequent tracking produces a very smooth trace on the controller's display screen rather than the progressive "jumps" characteristic of SSR targets. What's more, strategic location of the listening stations allows reception of aircraft signals in areas that are below SSR coverage or that are blocked by intervening structures. Position accuracy is also a strong point: over many evaluations, multilateration has been shown to be at least as accurate, and usually more so, than conventional SSR.

Diverse applications

Multilateration installations are now operating at a large number of locations around the world. These applications range from long-range, high-altitude airspace surveillance over very large areas, to terminal area traffic monitoring, to precise tracking and display of aircraft and vehicle movements on the airport surface. Such installations are even being used to automate the collection of aircraft user fees.

Among countries that have adopted wide area multilateration is the Czech Republic, which has chosen this solution over SSR to accurately track, maintain separation and record the increasing number of high-altitude aircraft transiting its airspace to destinations beyond. The Czech Republic's ANSP has established what is arguably one of the largest airspace areas in the world to be covered by multilateration traffic surveillance, at least with respect to those areas where the provision of conventional SSR is considered too costly.

In the terminal area, the tracking and separation of aircraft has been traditionally an exclusive SSR function. While unquestionably safe and efficient, SSR coverage of key areas can be hampered by local high terrain. This limitation led to the earliest certified use of multilateration for terminal airspace control at Ostrava, in the Czech Republic.

Located within a wide horseshoe of mountains, Ostrava and its surrounding terminal airspace posed a difficult challenge for the operation of SSR. The ANSP consequently opted in 2001 for a multilateration network solution, which was commissioned in 2002. By the following year, sufficient data had been obtained on the system's performance to receive formal approval from the Civil Aviation Authority to reduce terminal area aircraft separation to three nautical miles from the typical five miles. As well, the low level coverage of the multilateration system permitted its exclusive use below 3,000 feet in the Ostrava terminal area, well below the surveillance coverage of regional radars.

Yet one of the most demanding applications of the multilateration technique is in its use for monitoring landing approaches and airport surface movements. To achieve this, a number of the system's small receivers are strategically placed around the airport and its runway approaches to produce clear and unobstructed line-of-sight displays of all aircraft from the commencement of their final approaches to their landings and subsequent taxiing to their terminals.

In the approach area, multilateration's very high one-second update rate provides controllers with a virtually continuous and extremely accurate picture of the approach stream, which is especially valuable in monitoring parallel runway operations. As a result, multilateration systems have recently been chosen by the authorities at Beijing's Capital International and Madrid's Barajas airports for this purpose — an application that previously had been the exclusive domain of radar.

Perhaps equally important is the system's application to monitoring movements on the aerodrome's surface, which paradoxically remains one of aviation's most hazardous operating environments. With the current emphasis on avoiding runway incursions at aerodromes around the world, surface surveillance has understandably increased in importance.

In this respect, multilateration offers significant advantages. Inevitably, even local radars are "blanked" in some sectors by airport buildings and other obstructions, sometimes leaving significant areas of the airport surface uncovered and therefore invisible to controllers. In contrast, appropriately positioned multilateration stations can cover the total aerodrome surface without being affected by adverse weather conditions.

Era Corporation

Small unmanned sensor is one of several in a multilateration network surrounding Ostrava Airport, in the Czech Republic. The Ostrava network tracks all transponder-equipped aircraft flying below the coverage of neighbouring SSRs.

Aside from their installation in aircraft, vehicle tracking units can be installed on all vehicles which use the operational areas. Small, affordable and quickly installed, these units can readily be seen on the controller's display, with their unique vehicular identification tags allowing quick differentiation from taxiing aircraft, and thereby allowing appropriate communication messages to be sent. In January 2007, the Dutch ANSP selected multilateration-based vehicle tracking units for over 300 service vehicles at Amsterdam Schiphol, following similar introductions at the Copenhagen, Prague, Santiago and Cape Town airports. At Schiphol, vehicle movement monitoring will be an integral part of the airport's advanced surface movement guidance and control system (A-SMGCS), as it will be in the multilateration-supported A-SMGCS at Beijing.

One unique application of the technology is in its very precise height measurement of aircraft overflying at high altitudes. The worldwide introduction of reduced vertical separation minima (RVSM) is unquestionably having a very beneficial effect on airspace capacity. Throughout most of the world, aircraft may now operate with 1,000 feet vertical separation between 29,000 and 44,000 feet, compared to the previous 2,000 feet of separation necessary because of the lower accuracy of earlier aircraft altimeters. Nevertheless, the importance that aviation attaches to redundancy dictates that independent checks of aircraft flying in RVSM airspace is a prudent step. Consequently, a growing number of RVSM monitoring stations have been established at key points along major traffic routes. At Linz, Austria, a purpose-built five-station multilateration system routinely measures the altitude of aircraft operating in RVSM airspace to an accuracy of 50 feet and passes this information — along with each aircraft's individual identification — to the Eurocontrol Centre at Bretigny.

Multilateration has also found use in tasks not directly concerned with air traffic control, but which provide unusually valuable services to airport administrations. For example, the system lends itself well to noise and curfew monitoring, and several small airports have adopted it for that purpose. More importantly, it provides very accurate details of the arrival and departure times of all aircraft — information that facilitates the automation of airport billing systems.

Airport operators typically employ monitors that observe aircraft movements and enter the data manually. Estimates are hard to come by, but it appears certain that a substantial amount of an airport's revenue may be lost under such circumstances. In December 2006, the Port Authority of New York and New Jersey issued a contract for provision of a specifically tailored system dedicated to the fully automatic tracking and billing of all aircraft movements at its Kennedy, LaGuardia, Newark and Teterboro airports. Combined, these airports handle over 1.4 million aircraft operations and over 94 million passengers per year, making it one of the largest airport systems in the world, with significant revenue generated from the accurate billing of users.

Jim Jorgenson

ADS-B offers highly attractive performance, functionality and economics, while multilateration offers performance equivalent to a traditional SSR without requiring substantive avionics changes and investment by the aircraft operator

Multilateration and ADS-B

ADS-B is now entering service and will gradually spread to worldwide adoption over the next 10 to 15 years. In ADS-B, each appropriately equipped aircraft automatically transmits bursts of data which include the aircraft's identification, altitude, track, speed, intent (i.e., climbing, descending or flying level), plus other information. These transmissions are received by ATC and also by all other ADS-B equipped aircraft within reception range, where they are presented on cockpit displays in a similar fashion to that of an ATC screen. The cockpit displays usually restrict the presentation to show other aircraft within a crew selectable altitude band of up to 3,000 feet above and below their aircraft, thereby providing pilots with exceptional situational awareness of the traffic of interest, with obvious safety benefits. Eventually, it may be possible under certain circumstances for the system to be used by pilots for maintaining separation.

Today, relatively few aircraft carry complete ADS-B installations, but a growing number are transmitting ADS-B data from transponders that are tracked by multilateration installations. In the future worldwide ADS-B environment, networks of unmanned, strategically located ground-based transceivers will be established. These will receive the ADS-B transmissions from all aircraft within reception range and instantly retransmit this information to controllers' screens at the nearest ATC centre. In certain systems, the ATC centre can uplink weather, NOTAMs and other important flight information to the aircraft via the same transceivers.

During the lengthy transition to a complete ADS-B environment, the most important uplinked data will undoubtedly be that describing the flight paths of aircraft not yet equipped with ADS-B. These would be visible to controllers using radar or multilateration surveillance, but without the uplink would not be visible to the crew of an aircraft equipped for ADS-B.

Details of unequipped traffic are provided to ADS-B equipped aircraft via the traffic information service-broadcast (TIS-B), one of the ADS-B system's two supporting features. The other, known as the flight information system-broadcast (FIS-B), will carry weather, NOTAMs and other priority information. Both uplink transmissions are specific to the ground-based transceiver's coverage areas.

For ANSPs, the critical questions are therefore those that concern the timing of their transition to a full ADS-B control environment and the associated investment in a network of dedicated ground-based transceivers to cover their airspace. The date by which ground-based transceivers will be needed in a specific area is hard to determine, being dependent on the rate at which aircraft operators install equipment in their aircraft.

One economical solution to this transition dilemma is a scheme in which the basic multilateration ground station incorporates the full functions of a ground-based transceiver for a future time when aircraft equipage is extensive. During the interim period, basic multilateration provides high performance coupled with low-cost acquisition and reduced maintenance expense, either in covering additional airspace surveillance requirements or in replacing legacy SSRs, should that be necessary before full ADS-B service is required.

Supportive of management trends

The benefits of multilateration are being increasingly realized by ANSPs around the world, especially now that the

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Alex Smith, the Chairman of Era, is also a co-founder of the company. Russell Hulstrom is Vice President of Global Sales. Era, formerly Rannoch Corporation, is headquartered in Alexandria, Va., with product research and development centres located in the United States and the Czech Republic.

More information on multilateration and ADS-B technologies is posted at the company's website (www.erabeyondradar.com).

MPL represents a state-of-the-art ab initio airline pilot training programme

The newly established multi-crew pilot licence is focused from Day One on preparing the co-pilot candidate for the right seat of an advanced airliner, using a competency-based approach to training developed with an emphasis on improving flight deck safety

CAPT. CHRIS SCHROEDER
CAPT. DIETER HARMS
INTERNATIONAL AIR TRANSPORT ASSOCIATION

THE nature of the multi-crew pilot licence (MPL) that was introduced late last year is not clearly understood throughout the aviation community. In part this lack of comprehension has been fuelled by inaccurate statements about the newly created licence that have appeared in media reports. While the aviation community generally has been supportive of the new licence, certain comments based on misunderstandings about the rationale for the innovative programme have been unsupportive and could impede this valuable endeavour even before its advantages take effect.

The new licence qualifies the holder to perform co-pilot duties on aeroplanes operated with more than one pilot. It complements, and does not replace, existing ways of qualifying as a co-pilot for multi-crew operations (see "Technological advances facilitate change in licensing and training standards," *ICAO Journal* Issue 2/2006, page 22).

The MPL reflects the competency-based approach to training that was introduced by a 2006 amendment to ICAO Annex 1 (the annex to the Chicago Convention which contains provisions for personnel licensing). The new licence was subject to a risk and safety benefit study conducted by an ICAO panel of experts. Moreover, MPL implementation incorporates specific risk control measures developed by the expert panel, as well as a post-implementation proof-of-concept programme.

One common misconception about MPL is that the programme emerged as a countermeasure to the pilot shortage in Asia, and especially in China and India, where the pool of qualified personnel cannot keep pace with current industry growth. In fact, the MPL programme simply recognizes the significant advances in methodology and technology in the training sector that allow the air transport industry to sustain rapid growth by generating an influx of more appropriately trained pilots.

The MPL is part of sweeping changes to ICAO Annex 1 which came into effect in November — the first major update of the annex's provisions since 1948. When the initiative to modernize the international training provisions commenced in October 2000, there was no pressure to address the problem of a worldwide pilot shortage. Indeed, when the ICAO Flight Crew Licensing and Training Panel (FCLTP) convened its first meeting in 2002, the world's aviation community was still feeling the repercussions of 9/11, an event that suppressed demand for air transport services, and hence pilot recruiting. While the panel was not concerned about a pilot shortage, however, it was patently obvious that the 40-year old standards and recommended practices (SARPs) of Annex 1 (as well as the SARPs of Annex 6, which is concerned with the operation of aircraft) had become out of step with the evolving best industry practice and did not reflect the capabilities of advanced training devices, especially in the area of high-fidelity simulation.

The panel of experts that agreed on the changes needed in Annex 1 — subsequently reviewed by the Air Navigation Commission and approved by the ICAO Council — were nominated by 15 member States and a wide range of industry bodies representing pilots and aircraft operators, including airlines. One of the tasks facing this diverse group of experts was to evaluate alternative approaches to ab initio training for pilots to be employed in air transport, and today's MPL is the outcome of this comprehensive effort.

There is a perception among some that the MPL was created primarily as a means to save time and money by investing less in training. The FCLTP experts who fashioned the programme during the 2002-06 period were unanimously motivated by a desire to improve the safety standards that govern the operation of modern multi-crew civil aircraft. The MPL initiative was not driven by economic factors, although most members of the FCLTP, now disbanded, foresaw that the operations-oriented training approach could also reduce the duration and cost of pilot training.

PROOF-OF-CONCEPT INITIATIVE DEPENDS ON DATA QUALITY

THE INITIAL RESULTS OF MPL training programmes around the world will be carefully monitored by ICAO to assess whether there is a requirement to expand or improve on the current guidance material. Under the proof-of-concept project, protected information concerning the performance of trainees during and following the MPL training programme will be forwarded to ICAO by licensing authorities so that the organization can evaluate the existing MPL programme requirements and documentation on a periodic basis. The measure is intended to safeguard the long-term integrity of the MPL.

The quality of the data supplied to ICAO, especially in the early years of the MPL programme's

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The new MPL, as defined by Annex 1 and the first edition of ICAO Document 9868, the *Procedures for Air Navigation Services – Training* (PANS-TRG) that became applicable late last year, represents the best documented training system in ICAO's history. ICAO requirements include a stringent qualification standard for the approved training organizations that intend to deliver MPL training, as well as a data exchange between aviation authorities, training organizations and airlines. Also required is a continuous assessment of the student's performance during all phases of the MPL course.

Document 9868 prescribes the MPL training scheme in detail, as well as the required competency units and their elements, the respective performance criteria and instructor competencies. The document also furnishes States with guidelines for implementing an MPL programme; importantly, this includes guidance on the design and development of the MPL course, sample training objectives and assessment material, and explanations for the application of the threat and error management framework as an overarching principle that pervades all flight operations.

CAE photos

The MPL training scheme focuses on the development of competencies needed for multi-crew operations using training modules and devices required to hone the relevant skills

Contrary to the traditional ab initio training path, which is based on inventory and hours logged, the MPL training scheme is focused on the need to develop competencies which were identified by analysing the tasks performed by a crew operating a modern multi-crew transport in all phases of flight. In accordance with modern instructional system design, these competency units were broken down into elements which were further divided into performance criteria or statements of observable behaviour, each corresponding to a training objective. Course developers are able to establish an effective curriculum by defining the ultimate training objectives and mastery tests and then highlighting the training modules and devices required to develop these skills.

Some in the industry are under the impression that MPL candidates are not required to obtain solo flying experience. On the contrary, there was never a doubt about the necessity of including solo flying in the programme. Some pilot-in-command experience is important for building confidence. For this reason, the International Air Transport Association (IATA) supports retaining the Annex 1 requirement for a minimum of 10 hours of solo time. In all, the candidate is required to log a minimum of 240 hours. The flight experience in aircraft must include cross-country navigation, night operations, upset recovery and flight by reference solely to instruments. Much of the flying is acquired during Phase 1 (Core) of the four-phase programme.

Although the principle of threat and error management, as a fundamental aspect of multi-crew operations, is introduced at the earliest stage of MPL training, the capacity of a small single-engine aeroplane to meet multi-crew training objectives is admittedly limited. In this respect, training devices that provide for multi-crew interaction play the more effective role.

Training for multi-crew flight operations starts in earnest with Phase 2 (Basic) and remains on an operational basis for the subsequent training phases. In Phase 2, the relevant flight simulator training device must be — to borrow the term adopted for European regulations — at minimum a flight and navigation procedure trainer compliant with the multi-crew concept (FNPT II/MCC), and ideally should represent the specific aircraft type in use by the airline. The flight simulator training device can also represent a generic turbine-powered, multi-engine and multi-crew aeroplane. Whether generic or not, it is required to feature a daylight visual system designed so that both pilots can see the

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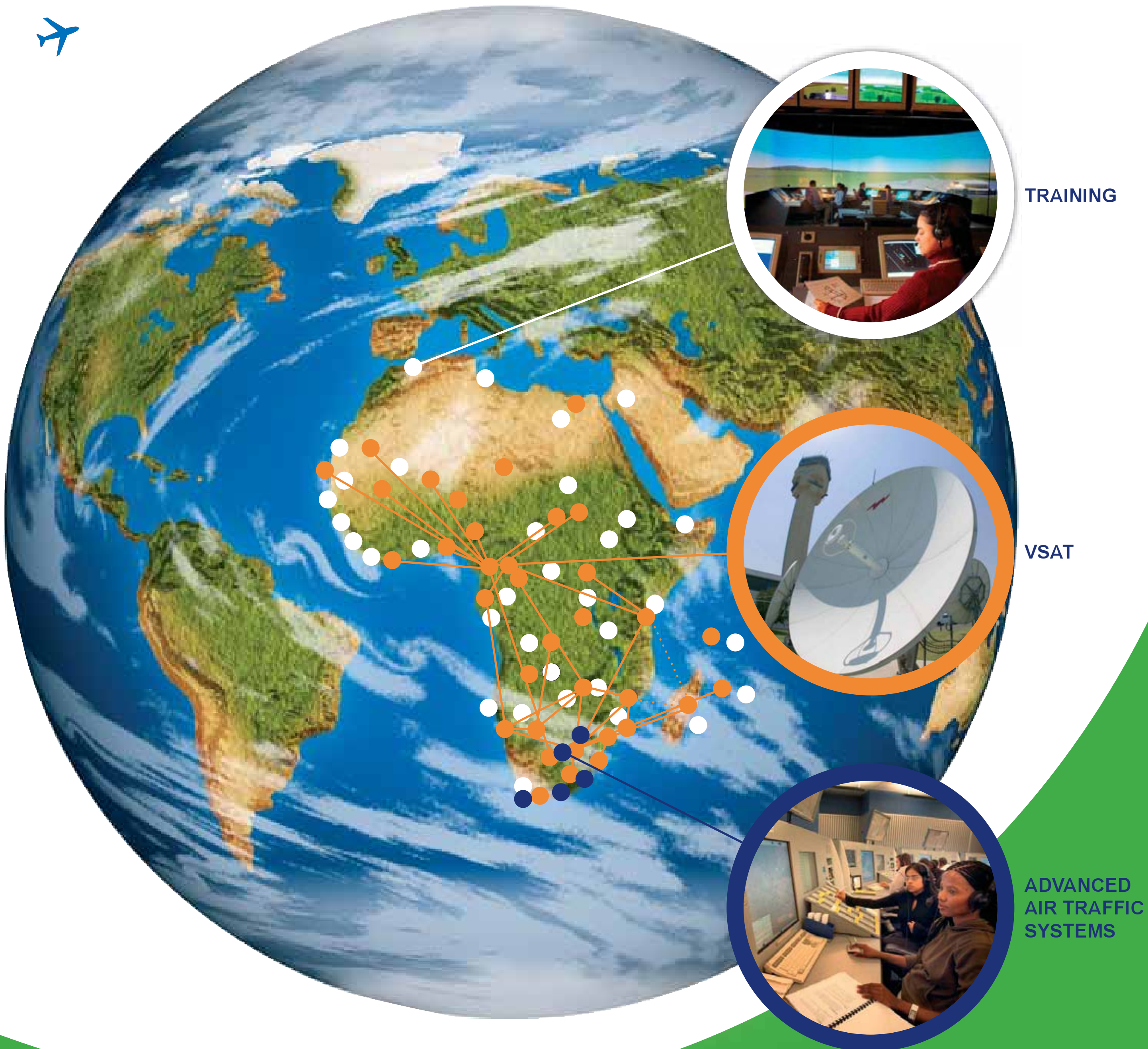
ATNS knows Africa



Whichever way you look at it

Responsible for approximately **10% of the world's airspace**, ATNS proudly manages more than **half a million** arrival and departure movements every year and is making **Cape to Cairo satellite communications** a reality. ATNS trains international aviation professionals, maintains **ISO 9001** accreditation and subscribes to **ICAO Standards and Recommended Practices.**

Non-standard ATC practices and procedures unveiled by incident investigation

An unauthorized take-off by a Cessna 172 pilot who misunderstood an instruction from the tower controller produced a risk of collision with an Airbus A320 departing on an intersecting runway, and highlighted the need for improvements in ATC practices at the aerodrome

TRANSPORTATION SAFETY BOARD OF CANADA

AN UNSAFE situation arose at Quebec City Jean Lesage International Airport on the morning of 13 June 2004 when an Airbus A320 and Cessna 172 took off from intersecting runways at the same time. The vigilant airline crew delayed the rotation of their Airbus A320 after spotting the airborne Cessna on a crossing path. The report of the incident highlighted the need for safety measures with respect to air traffic control (ATC) and administrative procedures at the aerodrome, and also raised concerns over the use of certain ATC phraseologies that are open to misinterpretation by flight crews.

Misunderstanding led to incident

Air Canada Flight 513 (ACA513), an Airbus A320 with 140 passengers on board, was on a scheduled instrument flight from Quebec City to Toronto, Ontario. At 0933:44 local time, ACA513 was cleared for take-off on Runway 24 at Jean Lesage International Airport.

Sixteen seconds later, a Cessna 172 departing from the same airport was instructed by the tower controller to taxi to position on the intersecting Runway 30 (see figure, page 19). The crew of ACA513 did not hear the controller talking to the pilot of the Cessna 172.

At 0934:34, a Cessna Citation in the parking area called the Quebec City ground controller. The strength of the transmission was low and the pilot's voice was practically inaudible. To improve reception quality, the controller deactivated the air frequency transmit button. He then realized that the Cessna 172 had started its take-off roll without clearance and was abeam of taxiway Bravo. Immediately thereafter, the controller twice attempted to instruct the crew of ACA513, which was rolling at a speed of 58 knots abeam of taxiway Alpha, to abort take-off. After realizing that the Airbus A320 was not slowing down, the controller then attempted to instruct the pilot of the Cessna 172 three times to initiate an immediate left turn. Neither the instruction to ACA513 nor to the Cessna 172 could be heard on the air frequency because the air frequency transmit button had been deactivated.

At 0935:20, about 1,000 feet from the intersection of Runways 24 and 30, when the A320 had reached its rotation speed (146 knots), the captain saw the Cessna 172 in flight on a converging track. He immediately ordered the co-pilot, who was at the controls, to delay the rotation and to not take off until they had crossed Runway 30. Radar data show that the Cessna 172 flew over the Airbus A320 with 200 feet of clearance above the intersection of the two runways.

The weather was suitable for visual flight. The winds were calm; there were no clouds below 5,000 feet, visibility was over six miles, and there was no precipitation. The automatic terminal information service (ATIS) message indicated that intersecting runways were active.

The Cessna pilot, who had not paid attention to the messages between the tower and the Airbus crew, thought that the instruction to taxi to position on the runway included a clearance to take off.

When the ATC communications recording was reviewed following the incident, a number of phraseology errors were noted. As a result, the Transportation Safety Board of Canada (TSB) examined the recording of the controller's most recent operational communications skills check, a review that revealed many instances of incorrect phraseology which had not been noted by the delegated evaluator.

The procedures for controlling air traffic are set out in the Nav Canada *ATC Manual of Operations* (MANOPS). The manual states that if an aircraft is Number 1 in the departure sequence, the controller can instruct it to taxi to position on the runway without specifying that it must wait for take-off clearance. The ATC MANOPS does not define "Number 1 for take-off." In this occurrence, the controller did not ask the Cessna 172 to wait after instructing it to taxi to position on Runway 30. The controller considered that the Cessna 172 was Number 1 in the departure sequence because the Airbus A320 had received clearance to take off.

The controller may clear several aircraft to taxi to position for take-off on intersecting runways provided that:

- the aircraft receive a departure sequence number when a departing aircraft is not Number 1 for take-off;
- the aircraft that is not Number 1 is instructed to "wait" and is informed of the reason for the delay;
- all aircraft are visible to the aerodrome controller; and
- traffic information is given to the sec-

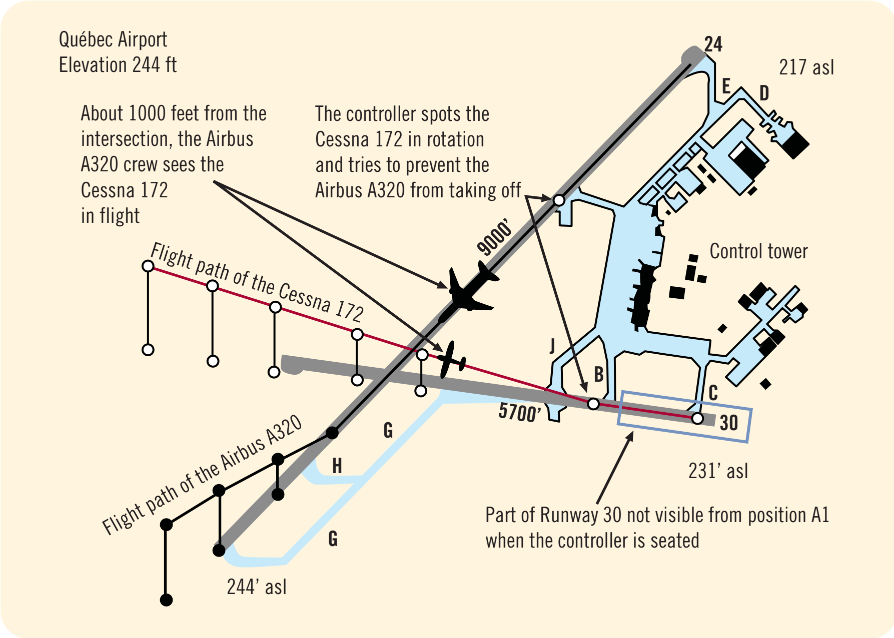
INCIDENT REPORT

This article is an abbreviation of the final report on an incident involving a risk of collision between an Airbus A320 and a Cessna 172 at the Jean Lesage International Airport in Quebec City, Canada on 13 June 2004. Released by the Transportation Safety Board of Canada on 5 April 2006, Report A04Q0089 can be viewed in its entirety at the organization's website (www.bst.gc.ca/en/reports/air/). Extracts appear here in the interest of promoting awareness of safety issues.

ond and subsequent aircraft in the departure sequence.

The controller must separate a departing aircraft from an aircraft using an intersecting runway, or a non-intersecting runway where the flight paths intersect, by ensuring that the departing aircraft does not begin its take-off roll until the preceding departing aircraft has passed the intersection, flown over the take-off runway or turned to avoid any conflict.

Review of the ATC tape revealed that, in the 15 minutes preceding the incident and in the five minutes after the incident, 62 of the messages on the air and ground frequencies were sent by the controller. Strict application of the ATC MANOPS standards revealed a substantial number of deficiencies in standard phraseology, including omission to identify the station, incorrect information sequence, omission of information, incorrect call-sign on a take-off clearance, and incorrect phraseology and terminology to cancel the take-off clearance of the Airbus A320.



About 1,000 feet from the intersection of Runways 24 and 30, when the Airbus A320 had reached its rotation speed, the captain saw the Cessna 172 in flight on a converging track. He immediately ordered the co-pilot to delay the rotation until after they had crossed Runway 30.

In June 2003, Transport Canada performed an audit of the air traffic services (ATS) at the Quebec tower, and noted that several reports on operational communications skills contained no comments as to the quality of phraseology. Also, the audit team noted that the bank of questions and the knowledge verification tests for the qualification maintenance programme contained very few critical questions in comparison with the number of ordinary questions. Transport Canada found that the Quebec tower was in compliance with established standards, and a corrective action plan for the above-noted non-safety–related deficiencies proposed by Nav Canada was accepted by Transport Canada.

In a review of the Quebec tower held 14-18 June 2004, Nav Canada identified the following deficiencies, among others:

- some anomalies relating to communications procedures;
- control personnel did not comply at all times with the ATC MANOPS requirements by not informing all aircraft of traffic, by not ensuring that readbacks were correct, and by not informing aircraft of the reason for the delay after clearing them to taxi to position and instructing them to "wait"; and
- some entries resulting in aviation occurrence reports did not indicate whether the report had been forwarded.

A memorandum from Nav Canada in August 2004 indicates that all deficiencies identified had been corrected or were in the process of being corrected.

The investigation found that, at the Quebec tower, there were some deviations from operating standards and that some controllers were not fully familiar with the radio system and some ATC MANOPS procedures. It was discovered that:

- some controllers do not report unauthorized take-offs;
- some controllers do not know, or do not fully know, the functions of the buttons on the radio console in the tower;
- pilots are not required, according to some controllers, to read back instructions to taxi containing the instruction "wait"; and
- there was an inconsistency with regard to the interpretation as to when an aircraft becomes Number 1 in the traffic sequence.

According to current regulations, Nav Canada must report all failures to comply with the Canadian Aviation Regulations (CARs) associated with the use of an aircraft. However, the investigation of the incident revealed that not all unauthorized take-offs were reported by the Quebec tower, even though Nav Canada policy and direction require that all aviation occurrences be reported. The reasons given for not reporting this type of occurrence were as follows:

- the possibility that the report would be prejudicial to a new

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CRUCIAL TO REPORT EVERY INCIDENT

IN INVESTIGATING THE MID-2004 risk-of-collision incident at Quebec City's airport, it was discovered there have been no reports of take-offs without clearance at the aerodrome for at least the preceding five years. However, the investigation also determined that there had been unreported incidents of unauthorized take-offs, and that Nav Canada and Transport Canada audits of the Quebec tower had not detected this deficiency.

It appears that some controllers and pilots alike do not understand that it is crucial to report each and every incident or error in the system in order to measure the effectiveness of aviation safety programmes, including those that measure risks of collision.

Airport operator can play a crucial role in promoting proactive joint safety management

The findings of a recent study suggest that safety is best served when the airport operator assumes overall responsibility for its management at the aerodrome and spearheads collaborative safety efforts based on the results of risk analyses

MARIEKE POOLMAN
MARK LEEMANS • MARTIJN MUSSCHE
KPLUSV
(NETHERLANDS)

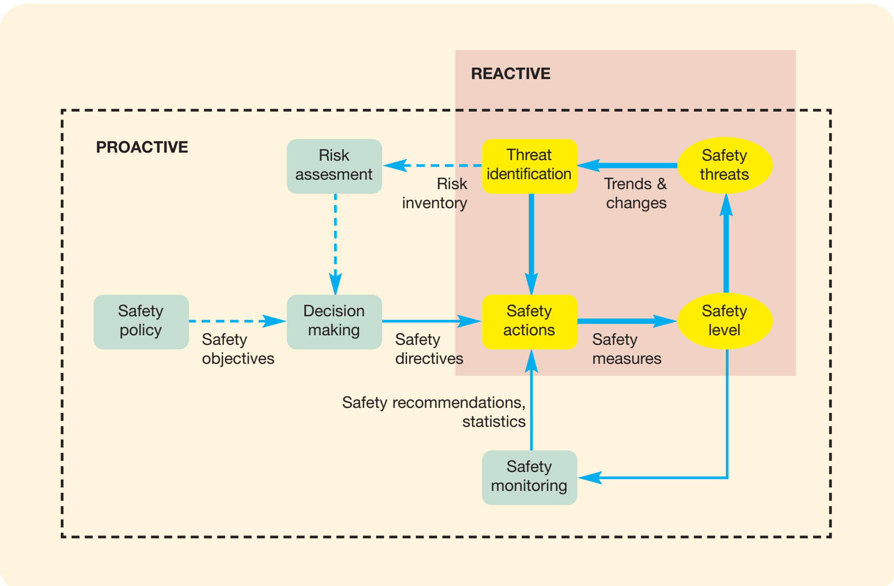
A RECENT study on safety systems at five European airports highlights several essential prerequisites for managing safety effectively. The comparison of the safety systems in place at different airports identified three measures in particular that are needed both at the individual organizational level and at the airport systemic level. In brief, the study, completed in December 2006, highlighted the need to:

- define safety as a clear strategic responsibility;
- ensure independence of the safety department, whose roles include oversight and providing advice; and
- implement a community-wide approach to safety, a strategy known as joint safety management.

The study looked in depth at aviation safety processes in place at London Heathrow, Frankfurt, Paris Charles de Gaulle, Madrid Barajas and Schiphol airports, and included interviews with representatives of governments, airport operators, major air carriers and air traffic services (ATS). Of particular interest were the organization of safety processes and the coordination and procedures followed by various stakeholders, as well as the development of a safety culture.

Clear, strategic responsibility

The study confirmed a strong correlation between the presence of a healthy safety culture and the attitude of senior management towards safety. Safety management receives higher priority and is more developed where senior management looks on safe operations as a matter of strategic importance to the organization's very existence. Does senior management present safety goals in the form of quantitatively expressed strategic targets, and is it held accountable for meeting these targets?



The safety management process contains both reactive and proactive elements; at a large airport, safety management is more effective when it involves all of the stakeholders in a proactive approach that is grounded on risk analyses

In some jurisdictions, senior managers are compelled to pay close attention to safety because of their potential personal liability. For example, in one country covered by the study, senior managers run the risk of imprisonment should their organization be found liable for an accident as a result of judicial proceedings.

In some organizations, senior management visibly assumes responsibility by initiating innovative approaches to safety. One driver for this proactive process is the highly visible personal responsibility assumed by the organization's chief executive officer (CEO), and the possible adverse response to an incident or accident by the organization's shareholders and clients. For this reason, the study concluded that privatization can have a positive effect on safety management in those organizations that have clearly made safety a high-level responsibility. Such privatization, however, needs to take place in a climate where shareholders recognize the importance of safety to the well being of the organization.

Clarity is paramount. Where there is patent recognition of the consequences of incidents and accidents to the organization as a whole, and for senior management in particular, good safety performance is defined as a strategic corporate target. Moreover, efforts are made to integrate safety considerations into every decision, as evidenced from the way the organization approaches risk analysis. In a safety-conscious organization, every change in organizational structure or processes is subjected to a risk analysis.

This pertains to changes having to do directly with the core business processes as well as changes having no discernible impact on operational safety, such as the relocation of the corporate office.

In terms of their strategic responsibility for safety, what sets one organization apart from another is expressed in the goals they set, the extent to which safety is addressed as an explicit part of strategic decision-making, and the role that senior management plays in decisions that could influence safety. Another indicator is the manner in which an organization's strategic goals are addressed by its corporate structure and the allocation of its resources.

In setting their strategic targets, some organizations need to be more explicit about the role of safety. By doing so, they promote safety as an integral part of decision-making and stimulate the safety culture of the entire organization. Senior management must actually be seen to take responsibility for safety by championing safety measures. There are several examples of positive cultural changes occurring after senior management initiated novel approaches to safety.

Jim Jorgenson

A safety department can perform more effectively as an oversight body and adviser when it functions separately from the operations department

Independence essential

In larger entities, safety departments tend to exist at both the organizational level and the local airport level, where in fact more than one department may be found. This creates a requirement for a great deal of interaction.

Most officials interviewed for the study opined that a safety office can perform more effectively when it functions apart from the operations department. Such separation makes it possible to focus entirely on monitoring safety and giving advice on improvements, and facilitates the safety department's role as an internal oversight authority. Oversight is accomplished by ensuring that risk analyses are conducted properly, and that safety is taken into account when making decisions. While this independence is beneficial, some direct relationship with operations is desirable, and typically this is achieved by assigning active pilots or air traffic controllers to part-time positions within the safety department.

ATS entities typically organize safety management at the corporate and local airport levels. At the corporate end, the safety department reports directly to the CEO; at the local level, the safety office reports to the highest local manager.

The role of the corporate safety office is three-fold: it collects and analyses safety information of concern to the entire organization; it advises on safety improvements at the corporate level; and it serves as an oversight body and adviser to the local safety departments. Decisions having to do with risk and measures to safeguard or improve safety follow strict, formalized processes, and the responsibility for decision-making lies with the most senior managers.

Airlines also typically have a safety department at the corporate level which reports to the most senior manager; in these organizations, too, decisions about safeguarding or improving safety are usually formalized.

At most of the airports studied, safety is the responsibility of the operations department. In some cases, the safety department reports to the operations manager, and at one airport studied, the operations manager also served as the safety manager. The rationale behind this practical approach is that safety goes hand-in-hand with operations, and since improvements in safety must manifest themselves in the operational sphere, it only makes sense to combine the roles. However, a few of the managers interviewed for the study observed that safety managers who were assigned an operational role were at a disadvantage, since they were compelled to negotiate safety measures with those responsible for achieving efficient operations.

The following picture emerges from the study: the more independent a safety department and the more access it has to senior executives, the more that safety will be explicitly reflected in the strategic goals of the organization. Similarly, the higher the safety office appears on the organizational chart, the more resources and authority that this department is likely to have at its disposal.

This situation can also apply to organizations of a smaller scale. Independence can be assured by creating a structural divide between the safety department at the operational level and the office that is designated to act as the oversight authority and safety advocate.

Joint safety effort

Several themes emerged with respect to the extent to which airports promote collaborative or joint safety management,

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The authors, employed by a consultancy firm based in the Netherlands, recently completed a study on safety systems at the largest European airports under contract to the Amsterdam Airport Schiphol Safety Advisory Committee. This article is a summary of the lessons evident in the KplusV study's comparison of the safety management processes observed at several airports.

Bustling aerotropolis has arisen at many leading airports

An airport with many of the attributes of a city is popularly known as an aerotropolis, a relatively new economic phenomenon of growing importance to the world's airport authorities

RUWANTISSA ABEYRATNE
ICAO SECRETARIAT

IN the not-so-distant past, an airport was simply a terminus that served air travellers and shippers — a place for passengers to begin or complete their journey. The traditional definition of an airport, however, is being refined to reflect the reality that many airports are actually complex industrial enterprises.

Quite apart from their essential airside activities, many large airports today house commercial facilities within the terminal building that serve both passengers and the non-travelling public. Airport authorities collect concession fees (i.e. non-aeronautical revenues) from concessionaires who specialize in various business activities, and in numerous airports around the world this income is significant. Indeed, such revenues often exceed the traditional income obtained through airport landing and passenger charges.

More and more, airports are evolving from being basic aeronautical infrastructures. Typically, terminal buildings incorporate duty free shops, specialty retail and brand name boutiques, restaurants, hotels, banks, office complexes, recreation and fitness centres.

A number of major hubs are facing a boom in non-aeronautical activities that are not directly related to air travel. For instance, Chek Lap Kok, Hong Kong's international airport, has more than 30 high-end designer shops. Singapore's Changi International pampers to fitness cravings and the continuing need for entertainment by hosting cinemas, saunas and even a swimming pool in the airport itself. Frankfurt Main has the world's largest airport clinic, with the capacity to serve 36,000 patients annually, while Detroit Metropolitan Wayne County has a 420 bedroom hotel in its main concourse. Munich Airport has its own hospital, while Amsterdam Schipol has a Dutch master's gallery and a casino. Beijing has quite a few banks carrying on business within the terminal building, while Stockholm's Arlanda Airport in 2005 solemnized marriages and officiated over 450 weddings in the vast chapel located within the terminal.

All this is of course related to the fact that a busy airport has scores of relatively affluent travellers flowing continuously through its terminals. This potential market for goods and services has prompted airport operators to refine their management structure. For example, many authorities have established separate real estate management and property divisions to capitalize on their landside commercial activities and enhance real estate values. One of the foremost in this area is Aeroports de Paris, which established its real estate division in 2003 to oversee landside commercial activities coming under the purview of Paris Charles de Gaulle and Orly airports. Amsterdam Schipol is doing the same and developing its real estate potential to build large office complexes, meeting and entertainment facilities, logistics parks, shopping and other commercial activities. Some other airports have aggressively put in place free trade and customs-free zones, golf courses, child and daycare centres, factory outlet stores and fitness centres.

Beijing, which is expected to emerge as one of the busiest airports in the next few years, is going ahead with building its Capital Airport City. This will provide shopping, entertainment, education, sports and leisure activities, while accommodating activities related to commerce, finance trade and housing. Dallas Fort Worth has concentrated its activities in the field of real estate development as a prof-

Civil Aviation Authority of Singapore

Among airports with major non-aeronautical activities is Singapore Changi, which caters to entertainment and recreation cravings by hosting cinemas, saunas, and even a swimming pool in the airport itself. Shown is a close-up view of Changi's restful orchid garden.

Munich Airport

CAAC

The annual Christmas Market at Munich Airport (top) fosters a sense of community. Any major airport has the potential to become an aerotropolis provided dedicated expressways and high-speed rail link business and residential areas; pictured is the high-speed magnetic levitation train that serves Shanghai's Pudong Airport.

itable adjunct to its traditional airport activities. Hong Kong airport's SkyCity is a colourful project which will contain a million square metres of retail, exhibition, office and hotel space very near to the terminal. This complex will also accommodate cinemas and mini theme parks.

Yet another spectacular development is the new airport city of Kuala Lumpur International Airport, which will be commercially held together by its large Gateway Park. This park will host office complexes, retail stores, a large automotive market and leisure venues which will cater to the aviation and non-aviation market in the city. In Seoul, Incheon International Airport will have its own mega-complex in its "Winged City," which provides for large business areas, shopping and tourism zones, as well as housing and medical services for airport workers and nearby residents.

Also in Asia, Suvarnabhumi, the new Bangkok International Airport that has just opened, has an entire "airport city" within its boundaries that includes an international business centre and conference and exhibition complex, shopping malls, car parks, hospitals, restaurants, and a large entertainment centre.

It is clear that what these airports are doing is developing a metropolitan commercial business district anchored on their strategically placed resources to create employment and generate revenue. This is a highly lucrative commercial practice and strategy implemented by major airports that are conscious of market potential.

The aerotropolis, as it is popularly known, is a natural corollary of the upturn of the economy in major cities as well as the contemporaneous advantage of an airport in promoting commerce in a fast moving globally networked economy. Advanced technology and high-speed communications are essential for today's businesses, and a modern airport ensures these are available to thousands of business travellers. Although the concept of the aerotropolis has been developed as a successful business model mostly in the Western world, Asia is not far behind and is gaining rapidly on a competitive level, as the examples above indicate.

Being very similar in concept to the traditional metropolis, which is a contrived formation of a central city and commuter-linked suburbs, the aerotropolis responds to society's demands for an agile multimodal transportation system with accessible sophisticated telecommunications. A functional aerotropolis is optimized by corridor and cluster development of high-volume commercial activity facilitated through "aerolanes" such as expressway links and trains linking the airport city to the airport itself. Infrastructure also has to be created for the smooth flow of buses, taxis and trucks between the two points.

Any major airport has the potential to become an aerotropolis, provided dedicated expressways and high-speed rail furnish links to business and residential clusters. Also required is efficient information communications technology.

There are three basic conditions that enable the aerotropolis to flourish. These are privatization, liberalization and globalization. Privatization involves the whole spectrum of economic activities that affect infrastructural services and could extend to such activities as power generation and customs clearing services. It has two main advantages, specifically the attainment of maximum profit and an improvement in service efficiency. For this reason, public enterprise has largely lost its appeal.

The liberalization and globalization of markets has occurred with the recognition of the advantages and virtues of intensified competition. Liberalization leads to greater entrepreneurial activity, and new private companies, with their market entry, make larger markets potentially available. The result of this heightened competition is better service at more competitive prices. In the case

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ICAO UPDATE

ICAO proposes major amendment of general aviation provisions

ICAO Contracting States and international organizations have been asked to comment by 15 July 2007 on a proposal to overhaul the ICAO provisions for international general aviation (GA) operations contained in Annex 6 (Part II) to the Chicago Convention.

The proposed modifications to the GA provisions are considered necessary because of major developments in the GA sector in the years since the regulations were first introduced, among them the emergence of a rapidly expanding corporate aviation sector and an innovative scheme known as fractional ownership, a concept that many States have yet to address.

The GA provisions currently contained in the annex were by and large established in 1968 and are still geared towards the GA environment prevalent at that time.

The ICAO Air Navigation Commission has recognized that the current Annex 6, Part II, "is lagging behind the developments in general aviation and is in danger of becoming irrelevant," the ICAO Secretary General informed member States in a letter disseminated at the end of March. "If timely action is not taken to amend Part II, this segment of international aviation could undergo changes in an uncoordinated manner as States develop their own regulations for contemporary general aviation, including large turbojet aircraft operating internationally and on intercontinental routes," the letter states.

The proposed amendment, intended to become applicable on 20 November 2008, was developed with the assistance of the International Business Aviation Council (IBAC) and the International Council of Aircraft Owner and Pilot Associations (IAOPA), and reflects significant changes including the advent of new technologies and more capable GA aircraft. It proposes dividing Part II of Annex 6 into three sections, with the first section covering general provisions and definitions. Section II would cover provisions applicable to all GA operations, and Section III would concern provisions for business/corporate operations and any operation involving large aircraft or any turbojet aircraft.

The amended provisions would address GA issues such as instrument approach criteria and equipage with ground proximity warning systems, and would introduce more stringent requirements for corporate and business operations and the operation of more sophisticated aircraft.

The proposed amendment does not yet address the question of fractional ownership as there is a lack of a clear and consistent definition for these types of operations and uncertainty about their commercial or non-commercial nature. However, States have been asked to comment on how fractional or shared ownership is treated by their regulatory systems. They were also urged to provide ICAO with specific information on its legal status so that the organization can work on resolving the issues in this area. It is possible provisions for fractional ownership could be included in Annex 6, Part II, in the future.

States have been asked to comment specifically on a proposed change to instrument approach criteria for general aviation. The current provisions apply an "approach ban" to all GA aircraft, whereby a precision instrument approach cannot continue beyond the outer marker fix and a non-precision approach cannot continue below 300 metres (1,000 ft) above the aerodrome unless the reported visibility or runway visual range (RVR) is above the specified minimum. The proposed amendment contemplates eliminating the approach ban for all GA operations, or alternatively, applying a modified ban only to operations involving large and turbojet aircraft covered under the new Section III. Under the latter option, the reported visibility requirement is eliminated with the result that the ban applies only to those approach operations where RVR is reported. States are requested to provide specific comments on both of these options in light of their own operating environments and requirements for general aviation. □

Seminars to help introduce performance-based navigation

ICAO's performance-based navigation (PBN) initiative has entered a new phase following the recent dissemination of a PBN manual in final draft form on the ICAO secure website, as well as other guidance on how States and air navigation service providers (ANSPs) can implement the PBN concept, which was developed as the most practical solution for regulating the expanding proliferation of navigation applications. The new information, available at ICAO-NET (www.icao.int/icaonet), includes guidelines on issuing operational approvals for PBN for different phases of flight. Since PBN revises the current required navigation performance (RNP) concept, the *PBN Manual* replaces the *Manual on Required Navigation Performance*, which is now out of print.

In order to assist States and operators with the introduction of PBN operations, ICAO is currently in the midst of organizing workshops in all regions of the world. So far 10 seminars have been planned, including one in Bangkok from 11 to 14 September, and another in New Delhi from 17 to 21 September.

The PBN seminars are intended for all stakeholders in the PBN implementation process, among them the State regulatory authorities, aircraft operators, ANSPs, and procedure design organizations. While some States are already moving ahead with PBN implementation, others will find the information provided at the seminars to be a necessity in getting their programmes under way.

More information on the seminars, and PBN in general, can be found at the ICAO PBN website (www.icao.int/pbn). □

Disclosure of ICAO safety oversight audit results

A total of 87 Contracting States and two territories had agreed by mid-May 2007 to the disclosure of either their full safety oversight audit report or an executive summary of the audit report at ICAO's public website. Audit results are currently available to all Contracting States at a secure website, but as of 23 March 2008 such information will be released in summary form to the public provided that the member State has authorized its disclosure. Beyond this date, ICAO intends to issue a press release revealing the identity of those States that have not given their authorization to release their audit results.

Efforts will be made during the 36th Session of the ICAO Assembly this September to encourage senior government officials to sign the release consent forms if their States have not already provided such consent. The forthcoming Assembly, to be held at ICAO headquarters from 18 to 28 September, will set out a work programme and budget for the organization for the coming three years, 2008-10.

Since January 2005, audits conducted under the Universal Safety Oversight Audit Programme (USOAP) are performed according to the comprehensive systems approach. This covers all of the safety-related provisions in 16 of the 18 annexes to the Chicago Convention, and is greatly expanded over the initial audit mandate, which was concerned with just three of the Convention annexes.

To date, 26 final safety oversight audit reports have been posted at the ICAO secure website, and nine States have provided consent to the release of audit information under this current audit cycle to the public. Recent final safety oversight audit reports that were posted on the ICAO secure website in April and May 2007 include Botswana, Bulgaria, El Salvador, Greece, Italy, Liberia, Namibia and Sierra Leone. □

ANB Director appointed

Nancy J. Graham

Nancy J. Graham (United States) has been appointed Director of ICAO's Air Navigation Bureau (ANB) for a four-year term. Ms. Graham assumed her duties on 2 April 2007.

The holder of a master's degree in science (technology management) and a bachelor's degree in management, Ms. Graham joins ICAO from the U.S. Federal Aviation Administration (FAA), where she served most recently as Asia/Pacific Regional Director (2005-07). In this capacity she was responsible for leading FAA efforts to strengthen safety in the region while encouraging procedural and system harmonization.

Prior to the Asia/Pacific posting, Ms. Graham was the International Technical Programme Manager at FAA's regional office for Europe, the Middle East and Africa. Specializing in air traffic management (ATM) technologies, systems and procedures, she has served as the senior ATM adviser to the Chief Operating Officer of the U.S. Air Traffic Organization and to the Director of the European and Middle East International Area Office, and has represented the FAA at various ICAO venues.

Ms. Graham formerly served as the Integrated Product Team Leader for the FAA's International Oceanic and Offshore Programmes, and has been Co-Chair for the informal ICAO Asia/Pacific Working Group responsible for implementing satellite-based communications, navigation and surveillance (CNS) systems in the international oceanic operational environment.

Prior to joining the FAA in 1991, Ms. Graham served in the U.S. Navy as the Programme Manager for Surface Ship Weapons Systems. □

Amendment greatly simplifies ICAO Annex 10

A recent amendment to ICAO Annex 10 addresses a wide range of provisions for different communications, navigation and surveillance (CNS) systems such as the aeronautical telecommunication network (ATN), the aeronautical mobile-satellite (route) service (AMS(R)S), the universal access transceiver (UAT) and automatic dependent surveillance-broadcast (ADS-B) using the 1090 MHz extended squitter.

Standards and recommended practices (SARPs) for these systems have been restructured, with technical specifications divided into a "core" element of SARPs, complemented by additional material to be published in an ICAO manual and by references to documents developed by other standards-making bodies such as the International Telecommunication Union (ITU) and RTCA.

The amendment simplifies Annex 10 by replacing some 1,500 system-specific provisions for the AMSS with approximately 150 performance-oriented SARPs that are mainly of a generic nature and not tied to a specific technology. The amendment of new system-level provisions for extended squitter, relocation of Mode S and extended squitter data formats, and the transfer of some other detailed provisions to a new technical manual, allow for a further significant reduction of standards in Annex 10. □

ICAO colloquium focuses on aviation emissions

A colloquium on aviation emissions held at ICAO headquarters in mid-May provided a comprehensive overview of a complex issue that will be high on the agenda of the 36th Session of the ICAO Assembly this September.

Where the question of aviation emissions is concerned, the forthcoming meeting of ICAO's Contracting States is just the beginning of an ICAO-led global effort needed to reduce the impact of aviation on the environment, according to ICAO Council President Roberto Kobeh González. "We also have to think of the upcoming years and ICAO's continuing leading role in a post-Kyoto period," he explained in a welcome address to the colloquium participants.

Participants at the Colloquium on Aviation Emissions held at ICAO headquarters from 14 to 16 May 2007 heard various stakeholders advocate possible approaches for dealing with engine emissions in aviation

ICAO, as the only global forum that can bring all parties together on international civil aviation environmental issues, will continue to lead the way, together with its 190 member States and in cooperation with the main international non-governmental organizations, asserted the Council President.

The Council President highlighted the importance of compiling information before taking action, noting that the International Panel on Climate Change (IPCC) had recently issued its fourth assessment report. "Once we increase our understanding of the situation, we will be in a better position to assess the magnitude of the problem, review proposed mitigation measures and establish a clear direction," he informed the colloquium.

ICAO Secretary General Dr. Taïeb Chérif also underscored the importance of utilizing data in the effort to minimize the adverse effects of civil aviation on the environment, one of ICAO's primary strategic objectives.

"Information is key to meeting this environmental challenge," he remarked. "Agreed and accurately characterized scientific and technical data are essential in developing forward-looking solutions. Precise technical information on aviation emissions and their impact on local air quality and global climate must form the basis of all measures."

Looking to the future, Dr. Chérif said that ICAO should develop the capability to provide information on the status of emissions and to assess the reduction achieved through technological and operational means, thus allowing the organization to determine whether additional measures are necessary.

Work is also under way to develop technological and operational goals, the Secretary General added. "We must continue to challenge aviation by setting goals," he proposed, noting that this process had worked well with respect to nitrogen oxides (NO_x) emissions. In the longer term, he predicted ICAO would probably regulate new aircraft engines with alternative fuel sources that would produce a reduced impact on the atmosphere.

In mitigating the environmental impact of aviation emissions, Dr. Chérif stressed that all possible mitigation measures would need to be explored. "Such measures must be made available under a clear framework, a framework that provides States with the flexibility to select alternatives in the most cost-effective manner." The ICAO emissions plan, he added, could prove instrumental in helping States achieve this goal.

Taking part in the three-day event were representatives from a wide spectrum of the aviation and scientific communities. Among the participants were panellists from leading civil aviation administrations as well as other government and industry bodies and a number of university research centres. Various discussions focused on scientific findings, methodologies used to assess the impact of aviation emissions, and technological developments, operational measures and market-based options geared to mitigate the effects of aviation on local air quality and global climate. A concluding panel discussion looked at possible approaches to deal with aviation emissions.

The colloquium focused on the outcome of the latest meeting of the Committee on Aviation Environmental Protection (CAEP), which agreed, among other things, on provisional emissions trading guidelines that will be examined by the 36th Session of the ICAO Assembly this fall (see "Experts propose guidance on how to include aviation in emissions trading scheme," *ICAO Journal* Issue 2/2007, pg 29).

MONTREAL CONVENTION

Bosnia and Herzegovina deposited its instrument of accession to the Montreal Convention of 1999 during a brief ceremony at ICAO headquarters on 9 March 2007, bringing the total number of parties to the Convention to 76. Shown on the occasion are Milenko Misic, Ambassador of Bosnia and Herzegovina in Ottawa (left) and Denys Wibaux, Director of the ICAO Legal Bureau.

Generally, colloquium participants expressed broad support for the leadership role played by ICAO in addressing the problem of emissions and other environmental issues, while pointing out the need for action by the entire aviation community. More information on the ICAO Colloquium on Aviation Emissions, including video clips of some of the presentations, is available at the ICAO website (www.icao.int/envclq/clq07). □

ICAO issues interim policy guidance on GNSS cost allocation

ICAO has established policy guidelines on global navigation satellite system (GNSS) cost allocation that are available to the organization's 190 member States in draft form until a consensus has been reached on the definition of basic services and liabilities of GNSS service providers.

The policy guidelines are the conclusions of a study that was initiated in 1998, when a worldwide conference on CNS/ATM systems implementation called on ICAO to address the issue of cost allocation amongst all users of GNSS, including its allocation between civil aviation and other user categories. Since then, a Secretariat study on the matter has been considered by various forums.

In a letter dated 29 June, ICAO member States were urged to apply the tentative policy guidance as much as possible in their negotiations with GNSS providers, responsible authorities and other interested parties. "The provisional guidance could serve as a tool for the civil aviation community to ensure an equitable treatment of all users," ICAO Secretary General Taïeb Chérif informed member States.

ICAO continues to monitor developments and to collect relevant information to make an inventory of GNSS applications. The organization will also further coordinate technical, legal and economic aspects associated with GNSS cost allocation. Once a consensus on the critical issues has been built, the provisional guidance is to be redrafted with appropriate wording for inclusion in ICAO's formal policy statement, the *Policies on Charges for Airports and Air Navigation Services* (Document 9082).

The provisional guidelines accepted by ICAO Council early this year call for basic GNSS services to be provided free of charge as a common good to a multiple number of user categories. Where there is a requirement for more advanced GNSS services, including augmentation services, the provisional guidance recommends instituting user charges to cover the higher costs associated with the higher quality service.

Before any costs are recovered for GNSS services, however, ICAO recommends using a consultative process to arrive at an agreement on how the cost will be allocated. Cost allocation amongst all users should be discussed and agreed upon through transparent negotiations and consultations between a GNSS service provider and representatives of civil aviation as well as other user categories, the provisional guidelines state.

The draft guidance also states that the cost allocation should be consistent with ICAO's policies on air navigation services charges. Such uniformity ensures that civil aviation is requested to pay only its fair share of the relevant costs, ICAO concluded, and prevents unfair discrimination against international civil aviation. □

Bosnia and Herzegovina assumes responsibility for airspace

The Government of Bosnia and Herzegovina assumed full responsibility for the airspace over its territory on 20 April 2007, when control was officially transferred from the European Force (EUFOR). The transfer took place at the ICAO European and North Atlantic Office in Paris with the signing of a protocol by the Commander of EUFOR and the Minister of Transport and Communication of Bosnia and Herzegovina, a ceremony that was attended by high-level officials from NATO, Eurocontrol, the European Commission and ICAO.

The ICAO regional office played a role in drafting the protocol, whose signing signalled the last step in a process that started 10 years earlier, following the signing of the Dayton Agreement. The Minister of Transport and Communication also expressed Bosnia and Herzegovina's appreciation for ICAO's support in establishing a functioning civil aviation administration and for its ongoing assistance with implementing the provisions of the *Convention on International Civil Aviation*.

The full transfer of responsibility for the airspace above Bosnia and Herzegovina, a phased process that began in 2000 with the opening of its upper airspace to civil air traffic, means the country now has the obligation to provide air navigation facilities and to implement standard systems needed for conducting international aviation operations.

More information on the recent transfer of Bosnia and Herzegovina airspace control, in particular video clips and documents related to the signing of the protocol, is available at the ICAO European and North Atlantic Office website (www.paris.icao.int/). □

FELLOWSHIP FUNDS

A group of States has made a donation of over U.S. $19,000 to the recently established Assad Kotaite Graduate and Postdoctoral Fellowship Fund. The ABIS Group — comprised of Austria, Belgium, Ireland, Luxembourg, the Netherlands and Switzerland, presented the donation at ICAO headquarters on 29 May 2007. Shown at the presentation are (l-r): Ricardo J. Heighes-Thiessen, Director of the ICAO Technical Cooperation Bureau; Lionel Alain Dupuis, Representative of Canada on the Council of ICAO; Silvia Gehrer, Representative of Austria on the Council of ICAO; ICAO Secretary General Dr. Taïeb Chérif; Daniel Ruhier, Alternate Representative of Austria on the Council of ICAO; and ICAO Council President Roberto Kobeh González.

World's airlines post higher profits

The scheduled airlines of ICAO's 190 member States posted an estimated combined operating profit of 2.9 percent of operating revenues in 2006, a significant improvement over the 1 percent recorded in 2005.

Expressed in U.S. currency, operating revenues for 2006 are tentatively estimated at $452.4 billion, up approximately 9.5 percent over 2005, with estimated operating expenses at $439.5 billion, some 7.5 percent higher than the preceding year. Yields, expressed in terms of operating revenues per tonne-kilometre performed, rose from 80.2 cents to an estimated 83.5 cents, while operating expenses increased from 79.3 to an estimated 81.1 cents. (A tonne-kilometre is a combined measure of passenger, freight and mail traffic which takes into account the distance flown.)

The net financial result — excluding the reorganization expenses of some U.S. carriers — is provisionally estimated to be a profit of about 0.6 percent of operating revenues, an improvement over the loss of about 1 percent in 2005.

The positive operating results came in spite of average jet fuel price increases of about 12 percent over 2005, which itself saw dramatic increases in the average fuel price (some 49 percent higher than 2004). Airlines adopted several offsetting measures to the escalating price, including specific fuel surcharges and related provisions, as well as reductions in controllable expenses, especially distribution costs and general overheads. This led to a reduction in unit costs of around 3.4 percent. Yields increased by 4 percent, more a reflection of the fuel surcharge and exchange rate differences than real strength on the pricing front.

It is estimated that airlines of four of the world's six statistical regions achieved, on aggregate by region, a positive operating result, thereby contributing to the overall operating and net results shown by the industry in 2006. The major improvement was in the performance of North American carriers, where a combination of capacity management and increase in traffic and fares led to a return to profitable operations ($7 billion in operating profits in 2006, compared to a marginal $200 million operating loss in 2005). Other regions thought to have achieved positive results were Europe, Asia/Pacific and the Middle East.

Looking to the future, slowing growth in real yields and limited scope to achieve further reductions in costs will affect carriers already faced with low operating and net margins. On the positive side, buoyant economic conditions and successful efforts to stimulate traffic should sustain above average traffic growth, especially by carriers in Europe and Asia. The expected positive impact of open skies agreements between the U.S. and Europe, India and China, and other liberalization agreements, should see the industry maintain traffic growth and profitability in the coming years. □

Number of fatal airline accidents decline in 2006

ICAO's annual analysis of aviation safety and security data has revealed that 2006 witnessed 13 fatal accidents and 755 passenger fatalities in scheduled air services worldwide, and 16 acts of unlawful interference causing two deaths and 27 injuries.

In 2005, member States reported 712 passenger fatalities as a result of 17 accidents, and six acts of unlawful interference in which three persons were killed and 60 were injured.

The safety statistics, based on preliminary information compiled from 190 Contracting States, are related to commercial air transport aircraft of more than 2,250 kilograms (4,960 lb) take-off mass, and reflect only those accidents resulting in passenger fatalities.

ICAO's analysis of aircraft accidents (which does not include those related to acts of unlawful interference) unveiled that despite an increase in passenger fatalities, the accident rate in 2006 rose only marginally to about 0.0193 fatal accidents per 100 million passenger-kilometres flown, compared with a rate of 0.0191 in 2005. The marginal rate increase reflects growth of around 5 percent in the volume of passenger-kilometres.

Non-scheduled operations experienced 13 fatal accidents in 2006, compared with 18 fatal accidents in the previous year. The number of passenger fatalities related to non-scheduled operations also decreased, to 81 from 249, in 2005. Accident rates for non-scheduled transport could not be estimated because of the lack of comprehensive traffic figures for such services.

During 2006, 16 acts of unlawful interference included four unlawful seizures or attempted seizures, three attacks on aviation facilities, three acts of sabotage or attempted sabotage, and one in-flight attack. □

Pilots and lawyers underscore need to protect safety data

A meeting of Brazilian pilots, lawyers and jurists in Sao Paulo in early May, held in conjunction with the 2nd Forum for Brazilian Civil Aviation Development, examined the issue of safety data protection, and called for Brazilian legislators to introduce measures to properly protect such data. ICAO gave a presentation to the meeting on legal guidance with respect to ICAO Annex 13; the guidance is intended to assist States to enact national laws and regulations to protect information gathered from safety data collection and processing systems (SDCPS), while allowing for the proper administration of justice. The group also heard presentations on this topic by representatives of the International Federation of Air Line Pilots' Associations (IFALPA).

In recent years, technological advances have led to an accelerated development of safety data collection, processing and exchange systems that generate information used to implement corrective safety actions and proactive, long-term strategies, but increasingly such information has also been used for disciplinary and enforcement purposes, and admitted as evidence in criminal proceedings (see "Guidance material addresses concerns about protection of safety information," *ICAO Journal* Issue 6/2006, pp 26-28). The pilots and lawyers meeting in Sao Paulo — members of the Brazilian National Civil Aviation Agency, Flight Crew Members Union, Airlines Union and the Brazilian Air and Space Law Society — expressed concern about this trend and urged their government to provide legal protection for SDCPS. Among other things, the pilots and lawyers suggested that Brazil establish an independent accident investigation and prevention safety board, and that further consideration be given to the new legal guidance contained in Annex 13. □

ICAO Council appointment

V. Elyseu Filho (Brazil)

Vergniaud Elyseu Filho has been appointed Representative of Brazil on the Council of ICAO. Mr. Elyseu Filho's tenure commenced on 1 January 2007.

Mr. Elyseu Filho graduated in 1970 with a degree in law from Mackenzie University, São Paulo. He subsequently studied law at institutions in both Brazil and Europe, including the University of São Paulo, where he specialized in public law, The Hague Academy of International Law, and the Faculté Internationale pour L'Enseignement du Droit Comparé (FIEDC) in Strasbourg. He graduated from the Brazilian Diplomatic Academy in 1976 and joined his country's Ministry of External Relations the following year.

After serving in the Division of International Acts (Treaties) and subsequently in the Western European Division, in 1981 Mr. Elyseu Filho was appointed as Second Secretary at the Embassy of Brazil in Stockholm, Sweden. He returned in1985 to Brazil to serve as Advisor and Deputy Head of the Division of Science and Technology, and went abroad again in 1989 as the First Secretary of the Brazilian Mission to International Organizations in Vienna.

Mr. Elyseu Filho was appointed Deputy Head of the Division of Disarmament and Sensitive Technologies in 1993, and became Deputy Head of the Division of the United Nations in 1997. The following year he was assigned to the Embassy in Bonn, Germany, where he served as Counsellor in charge of political matters. In 2000 he was named Counsellor at the Embassy of Brazil in the United States. He left Washington, D.C. in 2004 to become Head of the Division of Science and Technology in the Ministry of External Relations. Prior to joining ICAO, Mr. Elyseu Filho served from mid-2006 as Deputy Consul General of Brazil in Montreal. □

AGREEMENTS SIGNED

ICAO Secretary General Dr. Taïeb Chérif and Jean-Christophe Chouvet, the Representative of France on the Council of ICAO, recently signed two agreements on cooperation between France and ICAO. The agreements provide for the secondment of experts to the ICAO Secretariat to perform duties related to the Organization's strategic objectives.

ICAO Council appointment

F.P. Venier
(Italy)

Francesco Paolo Venier has been appointed Representative of Italy on the Council of ICAO. Mr. Venier commenced his tenure on 19 February 2007.

Born in Buenos Aires, Argentina, Mr. Venier graduated with a degree in political science from the University of Padua in 1981, and entered the diplomatic field for the Government of Italy in 1990. After serving in the Office of the Secretary General of the Italian Ministry of Foreign Affairs, he was appointed in 1992 as First Secretary of the Embassy of Italy in Guatemala. He became Political Counsellor at the Embassy of Italy in New Delhi, India in 1996.

In 2000 Mr. Venier returned to Rome to serve as Chief of the Mediterranean and Middle East Desk in the Directorate General for Development Cooperation at the Ministry of Foreign Affairs. He later was named Chief of Staff at the Directorate General for Development Cooperation.

Mr. Venier became the First Counsellor and Deputy Head of Mission at the Embassy of Italy in Jakarta, Indonesia in 2003. He was also in charge of the Economic, Commercial and Aid Section of the Italian Embassy. In 2006 he was named the Consul General of Italy in Montreal, a post that he continues to hold in addition to performing his duties on the ICAO Council. □

ICAO Council appointment

M. Vélez Malqui
(Peru)

Mario Vélez Malqui has been appointed Representative of Peru on the Council of ICAO. Mr. Vélez Malqui's appointment took effect on 1 April 2007.

A career diplomat who was born in Naples, Italy, Mr. Vélez Malqui joins ICAO while concurrently serving as the Counsul General of Peru in Montreal. He commenced his diplomatic career in Lima in 1971 following his graduation from the Diplomatic Academy of Peru.

During his 35 years with the Ministry of Foreign Affairs of Peru, Mr. Vélez Malqui has held progressively responsible positions both at home and abroad, culminating in his appointment in 2004 as the Minister of the Technical Secretariat of the Multisectorial Commission of the Institution for the Integration of Regional Infrastructure in South America (IIRSA), and as the Representative of Peru to the IIRSA.

Mr. Vélez Malqui has served in various embassies around the world, specifically in Denmark, Germany, Israel, Nicaragua and Paraguay, and most recently in Berlin, Germany from 2002 to 2004, where he held the post of Minister. In addition, he has been the Consul General of Peru in Los Angeles, United States, and early in his career served at the Permanent Mission of Peru to International Organizations, in Geneva. Over the years Mr. Vélez Malqui has participated as a delegate and representative of Peru at numerous international meetings and conferences. □

Bustling aerotropolis

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of airports, the effect can be seen in the typical price reduction of consumer goods in some airport shops immediately after they have been privatized.

Privatization also usually provides access to non-traditional sources of capital for financing airport infrastructure and development of services.

Globalization is the removal of trade boundaries, something that will facilitate the creation of an aerotropolis. Once such boundaries are broken, enhanced competition resulting from a liberalized market ensures sufficient economic advancement to facilitate the emergence of the aerotropolis.

An aerotropolis need not necessarily be built near a major hub airport. The potential for an aerotropolis would lie primarily in the airport's location, and secondly on whether a nearby aerotropolis exists in a neighbouring country. Taking account of these factors, airport planners can begin building an aerotropolis gradually. Aside from the local attractions, in particular the uniqueness of the environment, the absence of similar facilities in neighbouring countries would be significant as demand for such facilities rises around the world.

The aerotropolis venture has yielded exponential increases in job opportunities for the local population, and an influx of foreign exchange. Therefore this concept, which has been tried and tested, should be on the minds of any airport and urban development planner, particularly in tourist destinations. A fitting example is Miami, which experienced a boom in airline passenger traffic following the opening of the nearby Walt Disney World theme park. □

Tanzanian meteorological services

continued from page 11

The outcome of this work was the publication of a document on the principles of determining the cost of aeronautical meteorological services for en-route and terminal air navigation. The document highlights relevant aspects to be used internally to determine the cost of providing aeronautical meteorological services. Among aspects that it found must be taken into account are the investment expenditure including maintenance, operating and administrative costs, and the expenses related to training. The allocation of such costs between aeronautical and non-aeronautical users must also be considered, as well as the allocation of aeronautical meteorological services costs to the en-route and airport components.

In developing its own document, the TMA used relevant ICAO manuals as reference, in particular ICAO's *Policies on Charges for Airports and Air Navigation Services* (Document 9082), the *Airport Economics Manual* (Document 9562) and the *Manual on Air Navigation Services Economics* (Document 9161). Also referenced was WMO Guide No. 904, *Aeronautical Met Services Cost Recovery.*

The charges currently levied for both air navigation and airport landing and parking have been in effect for many years without review. Although there have been new infrastructure and technological developments, no significant change has been made to match the operating costs. However, following a costing exercise which came up with higher amounts than what could be recovered from airlines at the time, the Tanzania Airports Authority, CAA and TMO made interim arrangements whereby a portion of the recovered costs would be allocated to each body on the basis of mutual agreement.

The way forward. As the body coordinating the cost recovery for air navigation services in Tanzania, the CAA is in the process of assessing the cost for the provision of such services with the goal of revising charges. The Tanzania Meteorological Agency will participate in this process, anticipating that new cost recovery charges will be based on both the current and forecast levels of traffic.

In the meantime, the TMA strives at improving the quality of aeronautical meteorological services through the modernization of its equipment and through improved internal, regional and international communications using high-speed data links. The agency is also focused on the further development of human resources. □

Multi-crew pilot licence

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same imagery, thus enhancing crew coordination, situational awareness and call-out procedures. At this early stage of the programme, motion capability is not a requirement.

The flight simulator training device used in Phase 3 (Intermediate) must represent a specific turbine-powered multi-engine aeroplane type that requires two-pilot operation. The device must be certified to a standard equivalent to JAR/FAA Level B, which means that it has to be capable of simulating full daylight operations while providing each pilot with a continuous cockpit-wide minimum collimated view through 180 degrees horizontally and 40 degrees vertically. The Phase 3 device, which must incorporate air traffic control (ATC) simulation, is also required to provide a motion cue.

The simulator used in Phase 4 (Advanced), the final phase of the training programme, must be fully equivalent to a Level D or Level C flight simulator training device. This calls for an enhanced daylight visual system and ATC simulation.

One outstanding issue to be addressed concerns instructor qualification. Although not explicitly mentioned in the revised Annex 1 or PANS-TRG, instructors assigned to provide training in an MPL course need to be specially qualified for this role. In Europe, for instance, this question has been addressed by requiring that all MPL instructors complete an MPL instructor's training course. The objective is to ensure that instructors are able to comply with a competency-based approach to pilot training and assessment. Among other things, the two-day course deals with the integration of the threat and error management framework throughout the training process. It finishes with an assessment of the candidate instructor and a certificate for successful applicants. For instructors involved in the basic, intermediate or advanced phases of the MPL course, some experience in multi-crew operations is also a requirement.

Training for the MPL qualification is likely to be offered in all parts of the world. In Europe, for example, the MPL programme has already been introduced. However, compared to ICAO Annex 1 and PANS-TRG, the new Joint Aviation Requirements (JAR-FCL-1) are more prescriptive in certain areas, specifically with regard to the qualification of MPL instructors, the definition of the flight simulation training devices to be used in the different training phases, and the simulation of the ATC environment in the third and fourth phases of the training programme. Also spelled out are the particulars of the contractual agreement between the flight training organization conducting the MPL course and the airline intending to hire the graduates, as well as a requirement for monitoring implementation of the programme through an advisory board composed of representatives from aviation authorities, airlines, approved training organizations and pilot associations.

This at first glance is a very positive development. The only possible drawback is that the prescription of stricter standards by one authority may lead to different qualities of MPL training found around the world.

Among other examples of MPL implementation, the Australian Civil Aviation Safety Authority (CASA) has drafted amendments to its regulations and relevant civil aviation advisory publications to cater to the new programme. The consultation phase is under way and final amendments are expected to be adopted in November 2007. In China, the General Administration of Civil Aviation (CAAC) is in the process of amending its regulations in order to implement the new training programme. A number of other countries are involved in a similar process.

Several ongoing and future activities are expected to support the implementation of the new training regime. For example, a proof-of-concept initiative was launched by ICAO in January 2007 (see box on page 15) with the objective of facilitating the collection of relevant data that can assist national aviation authorities in implementing MPL and also for preparing necessary updates to PANS-TRG. A conference on the proof-of-concept results is expected to be held in 2009 or 2010.

An international working group was formed in June 2006 by ICAO for the purpose of updating ICAO Document 9625, the *Manual of Criteria for the Qualification of Flight Simulators*. This focus on flight simulation technology was undertaken at the urging of the U.S. Federal Aviation Administration (FAA), in light of the need for a more precise definition of the different types of flight simulation training devices required for each phase of the MPL course.

With assistance from the Royal Aeronautical Society (RAeS), the objective of the ICAO working group is to establish qualification standards for the approval of all flight simulator training devices on a worldwide basis. This is a major endeavour aimed at reversing an existing situation whereby the technical capabilities of simulators determine how these devices are used in training. Once global standards for such devices are in place, the required simulator fidelity and technical complexity will be defined by training needs. The newly formed group intends to publish an updated and expanded Document 9625 by the end of 2008.

Yet another supporting activity has been initiated by IATA, which is convinced that the MPL represents the state-of-the-art ab initio airline pilot training programme. Through its own global initiative, and for the benefit of its member airlines, IATA intends to spearhead the worldwide standardization and harmonization of MPL implementation. This initiative, which it is undertaking in close coordination with ICAO, will include the establishment of a working panel. Panel members will represent airlines, training providers, aircraft manufacturers, regulators and pilot associations — in short, all MPL stakeholders from all corners of the globe. □

Multilateration technology

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system's flexibility, breadth of application and economic advantages are being demonstrated daily. As in communications, where data links in certain applications are gradually superseding routine voice messages, and likewise in navigation — a field in which terrestrial aids are being supplanted by satellite positioning — technological evolution also characterizes surveillance, with multilateration and ADS-B expected to eventually replace radar in most, if not all, aviation applications.

But such transformations are in fact the normal state in air traffic management, and we can anticipate still more fundamental changes in the way aviation is conducted as the 21st century unfolds. Elements that were formerly regarded as being exclusively government-owned and operated, such as the traditional flag carrier, have already been widely privatized, and corporatization and privatization are spreading to other areas. Air traffic control, for example, is being transformed in a similar manner, as demonstrated by the growing number of privatized or partially privatized ANSPs. Along with this development, the provision of ATC-related supporting services is beginning to change. In a significant step in this direction, the U.S. FAA recently announced that its nationwide ADS-B surveillance service — which it describes as the critical "backbone" of its Next Generation Air Transportation System (NGATS) — will be provided by a private industry contractor. Under the FAA contract, the selected organization will be responsible for the design, production, installation, support and ongoing maintenance of over 500 ADS-B ground-based transceivers across the United States. In a break with the past, the FAA will not own and operate the surveillance system; its sole commitment, along with the operators that will benefit from the system, will be to pay for the service. Yet another example of this trend was the FAA's transfer of the staffing and operation of many of its airport control towers and its general aviation flight service briefing activity to the industry.

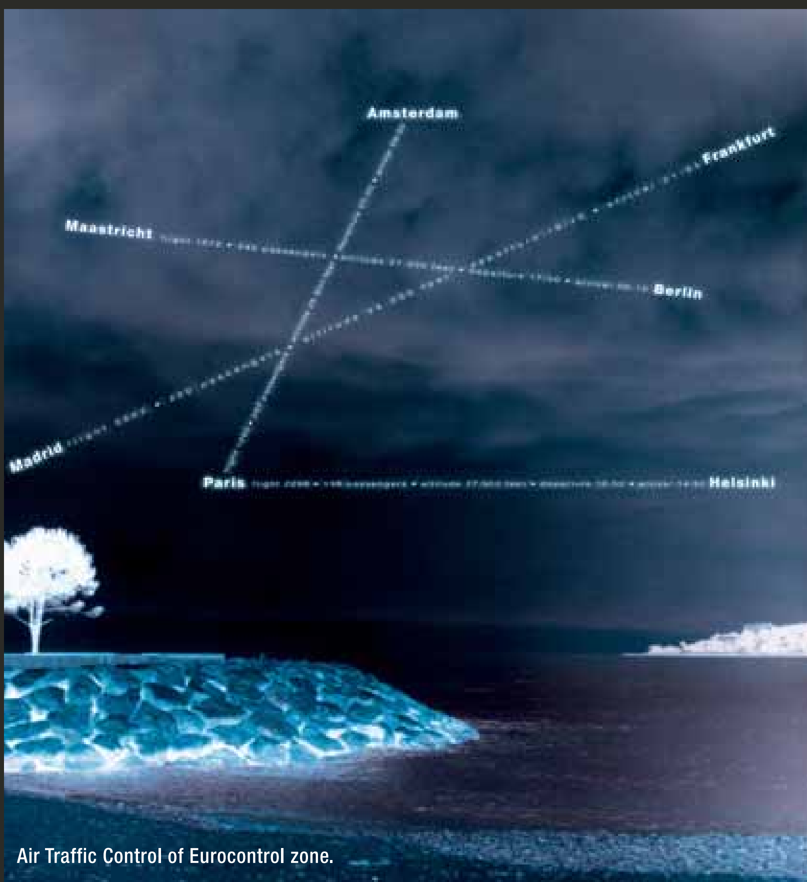
Taking this process a step further, one might expect that in the future many of the world's air traffic support services will be provided by private organizations under exclusive agreements with national or regional ATM authorities. The aforementioned system provides a scalable network backbone to enable these types of surveillance service models, with clear benefits to all stakeholders of air navigation services. □

Proof-of-concept initiative

continued from page 15

implementation, will prove crucial to the further development of guidance material. A letter issued by the organization in June 2007 provides States with specific guidelines for gathering these data in a harmonized manner. The dataset definition was achieved through a cooperative effort involving ICAO, State regulators, the airline industry and pilot representatives.

Standardized forms have been developed for collecting precise information in four specific areas. In addition to details about State regulations and the oversight of MPL licences, the forms request information on each MPL training programme offered by an approved training organization, the performance of each trainee, and the initial operational evaluation of each MPL holder. The identity of individual trainees will be protected by designating an identification number for tracking individual records for the purpose of analysis.



Air Traffic Control of Eurocontrol zone.

ICAO anticipates receiving information on State regulations and oversight of MPL licences by October 2007. The evaluation of other MPL data is expected to commence in late 2008. □

Incident report

continued from page 19

pilot or a pilot with little experience;

- the low probability that an air safety investigation would be initiated;
- air safety had not been compromised; and
- listening to ATS tapes might reveal errors of phraseology.

Confusion over similar phraseologies. The investigation identified similarities between the phraseology used by controllers in Canada and the United States to clear an aircraft onto a runway to hold or wait, and the ICAO phraseology used to clear an aircraft to hold short of a runway. Although this issue was not shown to have played a role in this occurrence, these similarities in phraseology have the potential to degrade the safety of the air transport system. The use of the word "position" in Canada and the United States is associated with a position on a runway, whereas the same word in ICAO phraseology indicates a holding position short of the runway.

North American crews operating in parts of the world where ICAO phraseology is used may confuse the term "taxi to holding position" with "taxi to position." This confusion could result in a crew taxiing onto an active runway when they had been cleared to a point short of the runway. In a letter dated 25 April 2003, ICAO stated that flight crews from States unfamiliar with ICAO phraseology have misunderstood "taxi to holding position" as meaning "taxi to position and hold," and proceeded to line up on the runway. These similarities in phraseology have the potential for catastrophic consequences.

Report analysis. The decision by the pilot of the Cessna 172 to take off after being instructed to taxi to position on the runway, and the manner in which ATC and administrative procedures are applied at the Quebec tower, played a significant role in the risk of collision.

Given that the controller was transmitting on the ground and air frequencies before the Airbus A320 took off, the pilots of both aircraft were able to hear what was being said to the other aircraft. In reality, the Airbus A320 crew was not aware that the Cessna 172 was on Runway 30, and the pilot of the Cessna was not aware that the A320 had been cleared for take-off on Runway 24. Since the captain of the Airbus and the Cessna pilot were bilingual, the use of both English and French by ATC did not contribute to their failure to be aware of the situation. They were either inattentive to external communications or preoccupied with piloting tasks. In any event, even if they had known that the Cessna 172 was on Runway 30, the A320 crew could not anticipate the unexpected take-off of the Cessna. For his part, the Cessna pilot would not have taken off if he had been aware that another aircraft had been cleared for take-off on the crossing runway.

When the controller realized that the Cessna 172 had taken off without clearance, he immediately attempted to contact first ACA513, then the Cessna 172. Since the transmit function had been disabled by the controller, the aircraft could not receive his instructions. The stress generated by the suddenness of the occurrence likely diminished the controller's effectiveness in responding properly to the emergency. It is possible that the lack of simulation of emergency situations and equipment failures in ongoing training contributed to his inability to solve the problem he was confronted with. It was the vigilance of the Airbus A320 captain and his effective management of an emergency situation that prevented the situation from getting worse.

Although the controller, who was also the duty supervisor at the time of the incident, had the authority to combine control positions and authorize controller breaks, his management of the work schedule contributed to the incident. Sufficient tower staff (counting the supervisor) was available to operate both control positions separately. Had the ground position not been combined with the air position, the air controller would not have deactivated the transmit button of the air frequency in an effort to solve a problem thought to originate with interference between the airport and ground control frequencies. The aerodrome/ground controller's intervention to stop the Cessna from continuing its take-off roll would most likely have been successful.

Investigation findings. The report presented three findings as to causes and contributing factors:

1. The Cessna 172 took off without clearance from Runway 30, causing a risk of collision with the Airbus A320.

2. The controller instructed the Cessna 172 to taxi to position on Runway 30, but did not instruct it to wait and did not advise that the Airbus A320 was taking off on Runway 24. The controller did not anticipate that the Cessna 172 might take off without clearance, causing a risk of collision with the Airbus A320.

3. Given that the controller deactivated the transmit button for the air frequency, neither the Airbus A320 nor the Cessna 172 could hear the controller's instructions to abort take-off.

The investigation resulted in the following findings as to risk:

1. The *ATC Manual of Operations* does not clearly define criteria for numbering aircraft in the departure sequence.

2. Some controllers in the Quebec tower misunderstood the operation of some functions of the radio console.

3. Canadian and U.S. phraseologies used to clear an aircraft onto a runway are similar in wording to ICAO phraseology to hold an aircraft short of a runway. Those similarities open the door to misinterpretation by crews with potential for catastrophic consequences.

Other findings:

1. The absence of simulation of emergency situations and equipment failures in ongoing training contributed to the controller's inability to solve the problem that he was confronted with.

2. A review by the TSB of Nav Canada's evaluations revealed that the division responsible for Nav Canada's evaluations did not realize that some controllers were not complying with standard practices and procedures.

Safety action taken. The report describes several safety actions taken by Nav Canada as a result of the incident. The complete final report, including safety action taken, is available at the TSBC website (see box on page 18). □

Airport safety systems

continued from page 21

as well as the manner in which this is accomplished. Joint safety management concerns how well the airport and all other stakeholders manage and improve safety together.

The general picture to emerge from the study is that explicit, joint safety objectives have not been formulated at the airports studied, although there is consultation across the industry and more or less coordinated safety actions are undertaken at all airports.

At one airport studied, a start has been made to strengthen joint safety management by adopting common safety objectives. The airport operator is the driving force behind this initiative because it recognizes that it can achieve its own strategic goal of zero serious injuries only by working with other stakeholders. By means of consultation, and through the stipulation of safety measures in contracts, the airport operator has been encouraging other parties to adopt its own safety goals.

As mentioned above, all of the airports provide for consultation and shared decision-making regarding any safety issues facing the airport community. At some airports, specific committees have been designated to focus solely on safety, and at others safety matters are discussed in more general forums.

The most common form of consultation takes the form of runway committees and ramp or apron committees. These bodies typically meet monthly or sometimes quarterly to discuss operational matters that have come up, including safety concerns. In most cases, the committees are attended by the local operational managers of the parties concerned, or their delegates.

At most airports union representatives participate in the committee meetings so that they can be involved in any decision-making from the outset. This participation is valuable, as early involvement of the union helps prevent labour disputes from arising. In addition to local consultative bodies on aviation industry safety, in some cases there also exist national forums; however, specific consultation on safety from a strategic perspective appears to be rare at any level.

Most of the joint safety actions formulated and carried out at the airports studied are of an operational nature. The officials interviewed agreed that the greater the strategic consequences of actions for those affected, the harder it is to implement such measures. The cost of taking action is often the biggest obstacle. For quite a long time the majority of the airports studied have been contemplating modifying their taxiway and runway systems to promote safety and maintain capacity, but a final solution is still not in sight.

In most cases there is some form of joint safety monitoring through the exchanges of periodic safety reports. ATS entities and airlines, in particular, exchange information systematically at the corporate level. This information is always in aggregate form, however. None of the organizations shares its raw safety data or details of specific incidents, and none of those interviewed thought that exchanging raw data would have added value.

While individual organizations perform their own analyses and the outcomes are shared and discussed, there is still no multidisciplinary, joint analysis of the information at the airport level. Usually the airport operator is regarded as the logical collector and manager of safety information for the entire airport community, a situation that requires airports to set up a system for the early detection of potential safety risks and to be prepared to take well considered action to manage these risks.

Risk analyses are performed by individual organizations at virtually all of the airports. These analyses are generally limited to those parts of the aviation process for which the specific organization is responsible, and other parties, if necessary, are kept informed. An exception is risk analyses for runway incursions: these are performed in a multidisciplinary, collaborative manner, but no standardized methods of risk analysis are used.

The problem with this approach is that some part or another of the system is not subjected to risk analysis because no one feels specifically responsible for it, or the party that is responsible does not yet use risk analysis. This situation mainly presents itself at airports where the operator does not assume an overall responsibility for airport safety or treats safety as an operational issue.

The general picture that has emerged from the above findings is that joint safety management is only partially realized at most of the airports studied. Joint decision-making takes place at the operational level, and collaborative action as well as safety monitoring is formulated primarily through the exchange of information, but joint safety management at most airports remains primarily reactive (see accompanying figure, page 20).

Although a collaborative proactive system has not yet been implemented at the airports studied, there is a trend at one airport towards the establishment of a joint safety system with common safety targets because of the development of strategic targets by the nationwide aviation industry. These strategic targets have compelled individual organizations to coordinate their safety decisions at the strategic level with the rest of the industry. Ambitious goals require these organizations to play a more central role in the improvement of joint safety management.

In summary, the study revealed that the more stakeholders become involved in the aviation process as a whole, the more likely they are to participate in a collaborative safety management system. A first step is to have a consultative structure in place at the airport, which makes it possible to formulate risk management measures at the tactical and strategic levels and thus address safety systematically.

At airports where the operator takes overall responsibility for system safety, the elements of a joint safety management system are the most elaborated. At these facilities, the operator has set up a safety-monitoring system for the entire airport community, covering all aviation activities.

The airport operator also plays a primary role in promoting a collective approach to safety issues. Driven by its strategic interest, the operator develops tools to further improve safety, thus pressuring its aviation partners to work safely. It may be prompted to adopt a safety oversight system that covers aviation activities as well as occupational health and safety. Where contractual relationships permit, the airport operator can require suppliers to adopt a systemic approach to safety.

The civil aviation authority can help establish joint safety management by encouraging the airport operator to take overall responsibility for airport safety as part of the airport certification process. Most operators view the certification process as a good incentive to raise the level of their own safety organization.

For some, airport certification has been the primary reason to develop a safety management system, but for the leading airport operators, it is nothing more than the next step in a process that is already initiated. For these airports, certification can be an extra push in the direction of a risk-oriented and proactive joint safety management system. □

ATB Director appointed

Folasade Odutola

Folasade Odutola (Nigeria) has been appointed Director of the ICAO Air Transport Bureau (ATB) for a four-year term. Ms. Odutola commenced her duties on 7 May 2007.

Ms. Odutola holds a master's degree in air transport engineering from Cranfield University in the United Kingdom, and a bachelor of science (honours) degree in aeronautical engineering from the University of Glasgow. A chartered engineer from the British Council of Engineers, she has accumulated 30 years'experience in the field of civil aviation, including responsibilities at the executive level.

Prior to her appointment to ICAO, Ms. Odutola served from January 2004 as the Rector/Chief Executive Officer of the Nigerian College of Aviation Technology, an ab initio training institute located in Lagos. She became head of the college after serving in progressively responsible positions in Nigeria's civil aviation regulatory system for over 20 years, culminating in her appointment as Director, Airworthiness and Operations Standards. During 2005-06 she chaired a task force on the verification of the status of aircraft and the operational competencies of commercial aircraft operators in Nigeria.

Ms. Odutola has been involved in various air transport activities, including the handling of air transport licensing and commercial matters, and has participated in meetings concerning bilateral air service agreements. She is a Fellow of the Royal Aeronautical Society.

Since commencing her career in 1977, Ms. Odutola has attended several technical and management courses covering various topics such as air transport economics, performance enhancement, management for directors and chief executive officers, and the management of training courses. □

ICAO MEETINGS

ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG/18)
3 – 7 September 2007, Bangkok

Airport Economics Panel (AEP/6)
10 – 14 September 2007, Montreal

High-Level Meeting on a Comprehensive Regional Implementation Plan for Africa (AFI Plan)
17 September 2007, Montreal

ICAO Assembly 36th Session (A36)
18 – 28 September 2007, Montreal

Machine Readable Travel Documents (MRTD/3) Symposium
1 – 3 October 2007, Montreal

AFI Planning and Implementation Regional Group (APIRG/16)
5 – 9 November 2007, Rwanda

Dangerous Goods Panel (DGP/21)
5 – 16 November 2007, Montreal

IN THE SPOTLIGHT...

SECURITY WORKSHOPS

An airport security workshop was held at ICAO headquarters from 16 to 20 April 2007. The workshop, whose participants are pictured above, was designed to provide States with the necessary training and tools in order to develop and implement airport security programmes at the international and domestic levels. Another security-related workshop, focused on national quality control, was held at ICAO headquarters from 28 May to 1 June. It attracted participants from Botswana, Ghana, Haiti, Jamaica, Mexico, Romania and Zimbabwe.

VOLCANO WATCH

The third meeting of the International Airways Volcano Watch Operations Group (IAVWOPSG) was held at the ICAO Asia/Pacific Office in Bangkok from 19 to 23 March 2007. The meeting, which was attended by 18 experts from seven States that host volcanic ash advisory centres as well as by relevant organizations, reviewed IAVW-related provisions in ICAO Annex 3 and in air navigation plans. In addition to addressing a number of issues related to the operation, implementation and future of the IAVW, the IAVWOPSG agreed on the need to evaluate the feasibility of rationalizing the issuance of volcanic ash advisories and warnings in order to increase system efficiency and promote safety.

DEPOSIT BY BELGIUM

Belgium deposited its instrument of ratification of the *Convention on the Marking of Plastic Explosives for the Purpose of Detection* during a brief ceremony at ICAO headquarters on 16 April 2007, bringing the total number of parties to the Convention, in force since 1998, to 132. Shown on the occasion are Godelieve Van den Bergh, Consul General of Belgium in Montreal, and Denys Wibaux, Director of the ICAO Legal Bureau.

FRANCE BESTOWS TITLE ON FORMER COUNCIL PRESIDENT

Dr. Assad Kotaite, President Emeritus of the ICAO Council, has been named by France "Grand Officier de l'Ordre National du Mérite," one of the highest French orders, in recognition of his eminent services to ICAO and to international civil aviation. The presentation was made by Jean-Christophe Chouvet, the Representative of France on the Council of ICAO (at right), in a ceremony at ICAO headquarters recently. At left is Monique Kotaite, the former Council President's wife.

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