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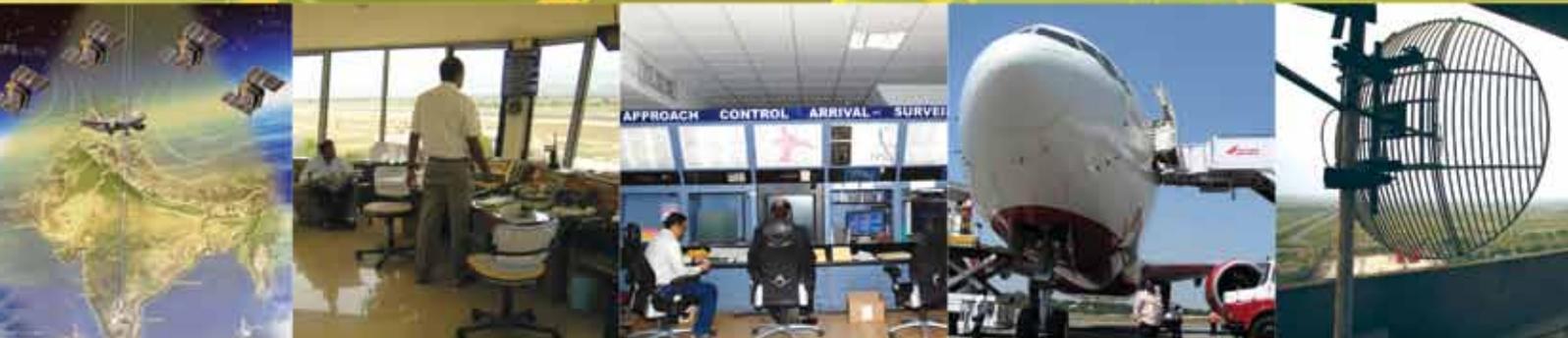
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Contents

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Message from the Regional Director

Mokhtar A. Awan
Regional Director
ICAO APAC Regional Office
Bangkok

Worldwide, the annual growth in passenger and freight traffic has been quite impressive during the 10 year period from 1996 to 2006, with cumulative growth of approximately 46 percent. The Asia and Pacific Regions (APAC) were solid contributors to this impressive achievement and could well overtake the European and North American Regions to become the world's largest air transport market in the next decade. Freight traffic for the APAC Regions is already the second largest globally, with an annual growth rate of 8.6 percent during 2006—two percent above the world average.

The hike in fuel prices in 2008, followed by the global economic downturn and H1N1 pandemic, brought new challenges for the aviation industry. Scheduled passenger traffic declined some 3.1 percent overall in 2009 compared to 2008—the largest decline on record for the industry reflecting the one percent drop in the world gross domestic product for 2009. International traffic fell by 3.9 percent, while domestic traffic fell by 1.8 percent. The double-digit domestic passenger growth in the emerging markets of Asia and Latin America, combined with the relatively strong performance of low-cost carriers in North America, Europe and Asia, helped curtail the decline in total traffic.

The good news today is that, with the improving economic situation in many parts of the world, a moderate recovery is expected in 2010 and this momentum should continue for a full recovery.

Increased aviation activity has brought major challenges for States and civil aviation agencies. According to Airports Council International (ACI), the Asia Pacific region has 96 members operating 475 airports in 47 countries. In 2008, these airports handled 1.17 billion passengers, 29.6 million tonnes of cargo and 10.8 million aircraft movements. Some of these airports are amongst the busiest in the world and many must cope with the impact of ever-increasing traffic in terms of airport capacity and infrastructure, constraints resulting from the introduction of new large aircraft such as the A380, and increasing safety considerations.

The safety, regularity and efficiency of aircraft operations at aerodromes being of paramount importance, many APAC States have enacted basic legislation featuring aerodrome certification requirements, including the implementation of Safety Management Systems at certified airports. ICAO has conducted several Courses, Workshops and Seminars to enhance State training activities in this area, the most recent being a course for Aerodrome

Inspectors. A Seminar/Workshop on Wildlife Hazard Management is also scheduled for December of this year.

Sustained increases in aircraft movements have also placed considerable pressure on airspace management. The ICAO APAC office, located in Bangkok and operated with the support and cooperation of States and international organizations, has helped to improve airspace capacity by facilitating enhancements such as the implementation of Reduced Vertical Separation Minimum (RVSM) and route restructuring.

As part of its responsibilities, the ICAO APAC's Air Navigation Planning and Implementation Regional Group (APANPIRG) has established a Target Level of Safety for en route airspace. The increasing complexity of air navigation procedures and requirements, coupled with essential interaction with States, also led APANPIRG to establish the Regional Airspace Safety Monitoring Advisory Group (RASMAG), in order to assist the safe implementation of RVSM and CNS/ATM systems and ensure States achieve established levels of airspace safety. APANPIRG adopted four metrics as a part of APAC Regional performance monitoring. In recognizing the importance of the seamless sky concept, ICAO will also conduct workshops on future ATM system next year.

The APAC Region recognizes the importance of cooperation and coordination between civil and military on flexible use of air space. The recent establishment of conditional ATS routes in the Region demonstrates this more effective civil/military coordination.

In order to increase airspace capacity and operational efficiency, APANPIRG established a Performance-based Navigation (PBN) Task Force to promote the implementation of PBN technologies. The APAC Regional PBN implementation plan has been developed and our Region is taking a lead role in the implementation of new ADS-B surveillance

technology. APANPIRG established an ADS-B Study and Implementation Task Force to facilitate State implementations in this regard.

APAC has additionally developed Communications, Navigation and Surveillance (CNS) strategies to provide guidelines to States for effective implementation efforts in this regard. APAC States have been cooperating on related data sharing and the updating of trunk circuits for applicable ground-to-ground networks to ensure effective information flows between local States and neighbouring Regions. In the last few years, more than twenty seminars have been conducted to facilitate planning and implementation of ATN, ADS-B and PBN infrastructure and procedures. These initiatives and activities demonstrate the spirit of cooperation and coordination between APAC's States and established a foundation for a seamless ATM system in the APAC Region.

Many improvements in the provision of meteorology for international aviation in the APAC Region have also been made in order to enhance air transport safety and sustainability. Notable among these is:

- OPMET availability has improved by 25 percent with regards to reception of METAR at SADIS.
- SIGMET test participants increased by 30 percent (eight States participating for the first time).
- Bilateral agreement on the issuance of SIGMET by China, on behalf of the Phnom Penh FIR, has been in place for more than a year.
- Regional implementation of 30-hour TAF for ultra-long haul flight planning more than doubled to 75 percent.

These accomplishments are a testimony to the APAC States' commitment to meeting international standards in providing MET services to airlines and operators. As a result of the recent Icelandic Volcano eruption, ICAO will monitor the results of the International Volcanic Ash Task Force (IVATF) in

developing a framework for contingency plans for weather phenomenon that include volcanic ash, tropical cyclones, Tsunami and radioactive clouds.

In the coming years, ICAO's main challenge will be to manage the ever-expanding aviation activity while maintaining the safety, security, sustainability and efficiency of civil aviation. ICAO's strategy for improving safety is detailed in the Global Aviation Safety Plan (GASP). An important element of this plan is that it complements the Global Aviation Safety Roadmap developed by the Industry Safety Strategy Group and is firmly founded on the principle of partnership. In May 2009, the ICAO Council approved the establishment of Regional Aviation Safety Groups (RASGs) with the aim of supporting more Regional performance frameworks for the management of safety. The establishment of RASGs will create both the awareness of Regional safety issues and a mechanism for addressing them. ICAO also provides several levels of safety management training to assist States in developing their own safety programs.

Another challenge the aviation industry is facing is the significant shortage of qualified aviation personnel. In the long term, this situation can only be addressed if regulatory authorities and industry cooperate and develop plans to effectively manage this important human resource issue.

ICAO continues to provide important and effective assistance to all of APAC Member States and aviation stakeholders, through the various programmes and mechanisms implemented by ICAO's Bangkok (APAC) Office. The APAC Office, as part of its technical cooperation activities, presently operates seven regional/Sub-Regional Programmes to maintain and continuously address ICAO's Strategic Objectives—Three Cooperative Development of Operational Safety and Continuing Airworthiness Programmes (COSCAPs) in North Asia, South Asia and South-East Asia, Cooperative Aviation Security Programme (CASP-AP), the Cooperative Arrangement for the Prevention of Spread of Communicable disease through Air travel (CAPSCA) to ensure the continuity of aviation operations during pandemic, Cooperative Agreement for Enhancement of Meteorological Services for Aviation in the South Pacific (CAEMSA-SP) and the ICAO Regional Flight Procedure Programme (FPP). Many of these programmes are discussed in the following pages.

I wish every reader an educational and enjoyable tour of these achievements as you read through our special Report. ∎

Mokhtar A. Awan

Realizing ADS-B Implementation and Data Sharing Objectives through Improved APAC Cooperation and Coordination

ADS-B implementation has been identified as a key enabler in achieving ICAO's Global ATM safety and efficiency objectives. As an emerging technology, ADS-B has demonstrated unparalleled characteristics compared with existing surveillance systems, but its true potential in the APAC Region is still dependent on improved coordination and cooperation being realized between ADS-B adopter States.

Li Peng, ICAO APAC Regional Officer, CNS, outlines the benefits and challenges of this emerging ATM technology and provides an outline of related implementation studies carried out by ICAO's ADS-B Study and Implementation Task Force and the South East Asia ADS-B Implementation Working Group.

Li Peng, a telecommunications engineer, joined the ICAO APAC Office as Regional Officer, Communications Navigation and Surveillance (CNS) in December 1997. Prior to joining ICAO, he was working with the Air Traffic Management Bureau (ATMB) of CAAC as Executive Director and General Manager of Civil Aviation Telecommunication Corp. He has been the secretary of the APANPIRG ADS-B Study and Implementation Task Force and has also provided Secretariat support to the South East Asia ADS-B Working Group.

Since the beginning of the 21st century, the air transport industry has continued to develop rapidly despite natural disasters, the spread of communicable disease, economic downturns and soaring fuel prices. The growth of air transport traffic in the APAC Region specifically has risen steadily over the past decade to become the world's largest domestic passenger market.

As a result of this growth, the aviation sector is now facing airspace, airport and spectrum congestion and current air navigation facilities and services must be modernized in order to meet these challenges. The major objective for APAC States and Air Navigation Service Providers (ANSPs) is to enhance the existing ATM system capacity and operational efficiency while ensuring that these move forward hand-in-hand with commensurate safety improvements.

To cope with the challenges involved, joint efforts have been made by regulators, ANSPs and airspace users in the Region, including the introduction of Reduced Vertical Separation Minima (RVSM), Reduced Horizontal Separation Minima (RHSM) and Performance-based Navigation (PBN) procedures

and technologies to enhance airspace capacity. Multi-parallel runway operations have also been introduced to compliment the newer mega-airports which have recently become or will shortly be operational.

An essential component of all these enhancements is the introduction of ADS-B ground surveillance.

The Eleventh ICAO Air Navigation Planning Conference (AN Conf/11) adopted a global Air Traffic Management (ATM) operational concept and recognized ADS-B as a foundational technology that would help provide substantial safety and capacity benefits. AN Conf/11 also supported the near-term and cost-effective implemen-tation of this technology wherever possible.

The ADS-B concept has the characteristics of scalability and adaptability, according to the specific needs and operational environment of each State and Region. ADS-B also enables the exchange of information related to navigation, surveillance and other operational characteristics in an integrated manner.

ADS-B applications will have a direct effect upon aerodrome operations, traffic synchronization, airspace user operations, and conflict management. These benefits will then influence the nature of airspace organization and management, demand and capacity balancing, and ATM service delivery management. ADS-B is a key component and enabler of next generation ATM systems which will evolve Air Traffic Control (ATC) from current radar-based systems to more cost-effective and satellite-derived aircraft locator technologies.

APAC ADS-B Implementation Activities

In late 2002, APANPIRG established an ADS-B Study and Implementation Task Force (ADS-B SITF) to promote ADS-B

surveillance services in the APAC Region. The many achievements of the Task Force included the selection of a harmonized datalink for use by transportation aircraft (i.e. 1090-ES), the development of an ADS-B Implementation Guidance Document (AIGD), guidelines for the development of an ADS-B Implementation Plan, a Regional surveillance strategy, Regional ADS-B equipage requirements for the period 2010-2020, a template for promulgation of ADS-B Avionics Equipage requirements, and guidelines for airworthiness and operational approval.

States implementing ADS-B are required to publish their equipage mandates as soon as possible, with a target publication date of no later than 2010 and an effective date for ADS-B equipage mandates after mid-2012. The EUROCONTROL ASTERIX21 Version 0.23 format for ground/ground data transition was also identified for use in the APAC Region.

Implementation issues concerning ADS-B have been addressed and studied by the ADS-B SITF. A series of ADS-B Seminars and/or Workshops were held throughout the Region (Australia, Thailand, Singapore, Fiji, India, Republic of Korea, China, Viet Nam and Indonesia) to assist States in understanding the technology and its many benefits.

APAC ADS-B Applications

In an effort to provide the operational improvements expected from the ADS-B roll-out, a number of applications have been identified and in some cases these improvements are already being implemented. The main ground-based surveillance applications in the short- and medium-term, as identified by the ADS-B SITF, are as follows:

- ADS-B-NRA enhanced ATS providing radar-like separation services in non-radar areas.
- ADS-B-APT improved airport surface surveillance.
- ADS-B-DAT sharing to enhance the surveillance and air/ground

communication capabilities in areas crossing FIR boundaries.

ADS-B is an alternate surveillance solution in areas where radar installations are impractical. The surveillance data derived from ADS-B air-ground surveillance systems is much more accurate than those from radar, in particular at the periphery of the coverage areas. In addition, the sharing of ADS-B-derived surveillance data can easily be achieved. This is especially the case in boundary areas between the neighboring ACCs of States. It will also be practical to share the associated air/ground communication capabilities from remote VHF stations that are co-located with ADS-B ground stations.

South East Asia ADS-B Working Group

The South East Asia ADS-B working group (SEA ADS-B WG) was established in 2007. It is working on the cooperative implementation plan supporting ADS-B as a surveillance tool in the South China Sea sub-Region. ATS routes L642 and M771 would be the first two routes to be served by shared ADS-B ground stations in order to enhance the surveillance capability in those area not currently covered by radar. The associated operational trial is expected to be conducted by the end of 2010, depending on new ATC automation

system capabilities in the States. It was envisaged that an ADS-B mandate for some flight levels could come into effect in 2014.

States in the sub-Region have been working together to develop sample agreements and technical templates covering ADS-B data sharing and the sharing of VHF communication capabilities. The sample technical memorandum for surveillance capability and data sharing developed by the Working Group was adopted by APANPIRG. Parameters and conditions, including the installation of filters at either side of the ATM systems were also discussed.

The Fifth Working Group meeting held in January 2010 developed a draft road-map for implementation of ADS-B in the South China Sea area. The project involves ADS-B data and VHF communications sharing among the ANSPs of Indonesia, Singapore and Viet Nam. Participating States have been urged to expedite approval of the project. The surveillance data derived from four stations considered for sharing (Natuna, Matak, Singapore and Con Son) are shown in Figure 1 *(below)*.

In addition, Australia and Indonesia are now working on a proposal for an ADS-B data sharing project to improve safety and efficiency at the FIR boundaries

Figure 1: ADS-B Ground Stations now under Consideration for Sharing in the South East Asia Sub-Region
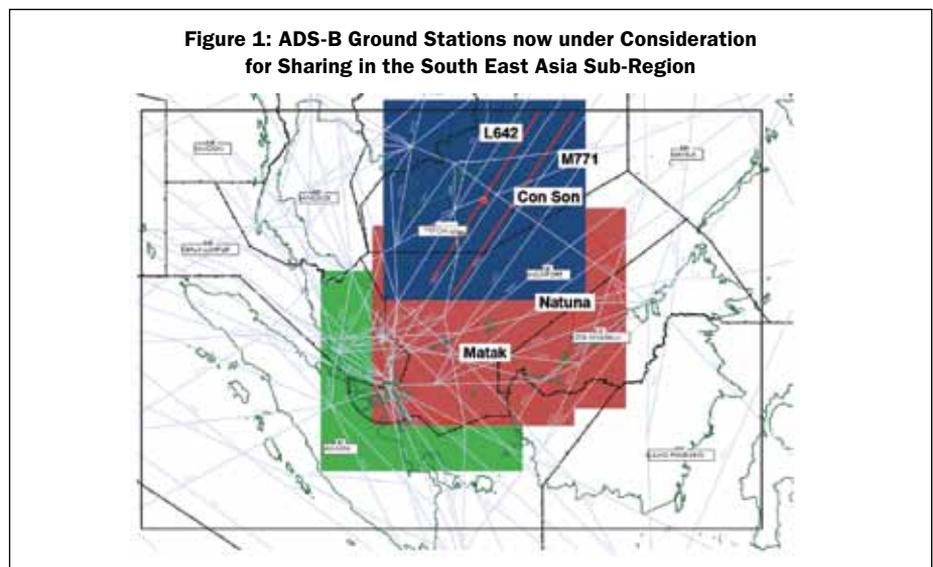
between Brisbane and Ujung Pandang. During Phase 1A of the project, Australia will provide ADS-B data from the Gove and Thursday Island ground stations and Indonesia will provide surveillance data form Merauke and Saumlaki. The objective of the projects was to share ADS-B data to provide situational awareness and support improved aviation safety. The Phase I project parameters approved by both sides will support the existing procedures and separation standards. The expected outcome of the project is as follows:

- Reduced coordination incidents at the FIR boundary.
- Earlier detection of ATC and pilot errors (coordination errors, incorrect fight levels, etc.).
- Technical and operational analysis of data in preparation for future applications of radar-like separation services.
- Increased support and confidence in data sharing to allow for the introduction of radar-like separation at FIR boundaries in a future phase.

Both sides will employ data filters. The ADS-B filter installed at Makassar ATS Centre has been tested and successfully integrated with local and foreign systems, sharing ADS-B data via MATSC ATC. The project is expected to be in full operation by 2011. The next phase of the project would progress to full radar-like separation when both parties have suitable ATC infrastructure in place. The following chart shows the sharing stations in Phase 1A—i.e. Australia providing data from Gove and Thursday Island Ground stations, while Indonesia provides data from Merauke and Saumlaki.

These projects are all excellent examples of Regional collaboration in the deployment and use of this promising new technology. Users of ADS-B services will need to fully understand the limitations involved. Back-up procedures still need to be developed for flight crews and controllers.

CANSO/IATA ADS-B Cost-Benefit Study

The cost-benefit study conducted by CANSO and IATA for the initial phase of ADS-B implementation over the South China Sea area indicates a strong business case for the project and identifies annual economic saving of over $4 million. It would also provide for environmental savings of about 10 million pounds of CO_2 emissions arising from reductions in airborne and ground delays.

Partial Equipage and Regulatory Issues

Although more than 70 percent of aircraft are equipped to fly in an ADS-B airspace, it is unlikely that all aircraft will have homogeneous avionics. This situation will persist during the coming transition period. Ground systems will therefore have to be capable of coping with a heterogeneous set of aircraft capabilities, local system sophistication, etc., while still providing the required quality of service.

In some airspace, priority may be given to more suitably-equipped aircraft. This will provide economic benefits to those aircraft that have been certified, which would in turn encourage airlines to modernize their fleets more quickly in order to reap the benefits afforded by ADS-B. There are common regulatory issues, such as flight standards and certification, and each State will have to resolve these issues to ensure Regional/ global harmonization.

In accordance with a conclusion formulated by the APANPIRG/20 meeting, ICAO APAC organized a Workshop in August 2010 to deliberate these issues in order to achieve common understanding on ADS-B OUT-fitment requirements for international aircraft fitment, Regional operational requirements and compliance timings for ADS-B OUT service.

GNSS Integrity Prediction Service

Implementation of a suitable GNSS integrity prediction service should be considered wherever ADS-B air-ground

surveillance is implemented. Early implementations of ADS-B are expected to use GNSS for position determination. ANS Providers may elect to use a GNSS integrity prediction service to assist in determining the availability of useable ADS-B data. This service would enable the users to take necessary action when the ADS-B positional data may be inadequate to support the application of ADS-B separation for the area.

Multilateration Trials

Several States and administrations have conducted ADS-B multilateration trials and/or evaluation programmes, including the Wide Area Multilateration Project. Multilateration is a technology that can supplement SSR and ADS-B with multiple ground stations employing triangulation to work out the position of an aircraft. The signal used is the 1 090 MHz ATC transponder signal (Mode S squitter, ADS-B transmission or mode A/C reply).

Multilateration can provide surveillance for aircraft not equipped with ADS-B and, in the short-term (prior to implementation of ADS-B), multilateration would serve as an alternative to radar. Regional surveillance strategies encourage States to make use of multilateration for surface, terminal and area surveillance, where appropriate, as an alternative or supplement to other surveillance systems.

Conclusion

ADS-B has well-demonstrated its capabilities and unparalleled characteristics compared with existing surveillance technologies. Implementation of ADS-B data-sharing between States to enhance flight safety is encouraging but will require Regional collaboration and further cooperation and coordination between stakeholders.

The role of ADS-B in achieving ICAO's envisioned Global ATM System should not be under estimated. ∎

ICAO Dangerous Goods Training Programme

ICAO has launched an exclusive new Dangerous Goods (DG) Training Programme based on the recently revised *Dangerous Goods Training Manual* (Doc 9375). The Programme consists of this new manual and several courses which will assist States in complying with the broad principles governing the international transport of dangerous goods by air as outlined in Annex 18—*The Safe Transport of Dangerous Goods by Air* and detailed in the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284).

Main benefits of the ICAO DG Training Programme include:

- **Courses and materials are delivered by ICAO directly—no third parties.**
- **Programme is developed specifically for State Inspectors, but will benefit all personnel dealing with DGs.**
- **Participants receive an official ICAO certificate upon successful completion of a test.**
- **Courses are based on the ICAO *Technical Instructions*—the only legal source of regulations for the safe transport of dangerous goods by air.**
- **Courses are delivered by senior level DG personnel with extensive experience.**
- **On-site training is offered to maximize availability and minimize costs.**

The first course—*Using the Technical Instructions*—is a prerequisite/refresher course that reviews the *Technical Instructions* section by section employing real-life examples and scenarios. Potential students should be well-versed in aviation terminology. Familiarization with the transportation of dangerous goods by air is useful, but not mandatory. Montréal course dates for Using the Technical Instructions are now established but spaces are limited.

Applicable 2011 course dates*:

14-18 February	**25-29 July**
7-11 March	**12-16 September**
11-15 April	**24-28 October**
16-20 May	**21-25 November**

* With the exception of the February course in Brisbane, Australia, all courses will be held in Montréal, Canada. All dates and availability are subject to change.

Register today!

APAC Airspace Safety Monitoring

The Asia/Pacific (APAC) Regional Airspace Safety Monitoring Advisory Group (RASMAG) was established by the Asia/ Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) to facilitate the safe implementation of reduced separation minima. It also works to assist APAC States as they harmonize national/Regional airspace levels with established international norms.

As Kyotaro Harano, ICAO APAC Regional Officer, Air Traffic Management (ATM) reports, the APAC RASMAG continues to provide critical assistance to Regional stakeholders and States as they seek to update their airspace monitoring capabilities on the basis on the most advanced systems and capabilities available. These advances promise to bring significant improvements to APAC aviation safety and efficiency metrics.

Kyotaro Harano joined the ICAO APAC Regional Office in 2004 as Regional Officer, Air Traffic Management (ATM). He was additionally part the ATM Section at ICAO Headquarters from 1996 to 1998. Prior to his years with ICAO, Harano spent 20 years with Japan's Civil Aviation Bureau, initially as an air traffic controller at Nagoya Airport, Tokyo (Haneda) International Airport and the Naha Area Control Centre.

As sub-Regional implementations of Reduced Vertical Separation Minima (RVSM) and reduced horizontal separation minima (e.g. RNP 10 and RNP 4) was proceeding throughout the APAC Region, the increasing complexity of the associated requirements and the necessary State interactions led the 14th Meeting of the Asia/Pacific (APAC) Regional Airspace Safety Monitoring Advisory Group (APANPIRG/14, August 2003) to establish the APAC Regional Airspace Safety Monitoring Advisory Group (RASMAG).

RASMAG has thus been providing its highly technical over-sight services for the Region under the professional guidance of its Chairman, Robert Butcher of from Airservices Australia, for several years now.

APAC Regional Impact Statement

One of the challenges set out before RASMAG during its fifth year of operations (2008) was the preparation of an Asia/Pacific RVSM Regional impact statement. The purpose of the statement was to summarize the estimated consequences stemming from the planned 2010 adoption of ICAO's global provisions for the long-term monitoring of the height-keeping performance for the individual airframes involved in RVSM operations.

RASMAG completed the *Asia/Pacific Regional Impact Statement RVSM Global Long Term Height Monitoring Requirements*, and the document was subsequently reviewed by APANPIRG/20 (September 2009, Bangkok). APANPIRG/20 tasked RASMAG to conduct further investigations and provide suitable recommendations regarding the types and appropriate locations for monitoring systems which could effectively monitor APAC's aircraft fleets. It also instructed RASMAG to seek solutions which would be effective while incurring minimal infrastructure investment.

RASMAG considered several options in responding to the APANPIRG task. GPS Monitoring Units (GMUs) were assessed with respect to their ability to be deployed around the Region with relative flexibility; however they were not deemed to be adequately efficient in terms of time and cost. Existing ground-based Height Monitoring Units (HMU) were also looked at. These require fixed sites which often require very careful planning and deployment lead times. ADS-B systems were also highlighted for their relative cost-effectiveness; however these too would require location planning such that they would be effectively aligned with major traffic flows.

While these assessments were ongoing, plans for the use of ADS-B as a height monitoring system were already well advanced in Australia—primarily due to the positive results from joint research activities being conducted between Australia the United States. ADS-B was able to provide Australian airspace managers with their most cost-effective monitoring option given the extensive network already in place and the large number of ADS-B equipped aircraft operating in the Australian Flight Information Regions (FIRs).

For other areas within the APAC Region, however, while some ADS-B systems are being planned, pressing deadlines and the lack of a mature mandate for ADS-B equipage in some States has meant that other monitoring systems will likely be implemented instead in the short-term.

Long-Term Height Monitoring Infrastructure

RASMAG has also focused on options that would be provided to APANPIRG/21 (September 2010) regarding suitable Height Monitoring Units (HMUs) for the Region. The analysis of traffic flows was conducted in light of the fact that APAC's Regional fleet does not have access to the ground-based height monitoring facilities in Europe and North America. The high-level analysis therefore focused itself on systems that would suitably accommodate these various factors.

In assessing the types of height monitoring infrastructure required, RASMAG agreed with the following:
- For the Japanese FIRs, HMU(s) would need to be able to capture the domestic fleet plus those aircraft operating across the North Pacific or between Japan and Southeast Asia.
- For the Chinese FIRs, several HMUs would be needed to accommodate the large domestic fleet that operates within those FIRs only, as well as additional international flights. Additionally, monitoring capability would be available through Enhanced GMU (EGMU) in cooperation with China's Regional Monitoring Agency (RMA).
- For Southeast Asia, given the infrastructure proposals covering adjacent FIRs, fleet monitoring could be accommodated via available EGMUs.
- For India/Pakistan, the type and location of a HMU suitable for the relatively large domestic fleets involved would be determined following a more in-depth analysis by both States in coordination with the Monitoring Agency for the Asia Region (MAAR, Thailand). In the short-term, monitoring could be effectively provided using existing EGMUs.
- For the Australian area including Indonesia, New Zealand and Papua New Guinea, the widespread Australian and Indonesian ADS-B network, in addition to the proposed ADS-B mandate for Australian airspace effective 2013, would provide significant monitoring capability without the need for other ground-based systems. Additionally, EGMUs will cover any aircraft/fleets not requiring ADS-B equipage or that would not be operating within the Australian or the Indonesian FIRs.

Reports from APAC RMAs and EMAs

APANPIRG has established a Target Level of Safety (TLS) for en route airspace in the APAC Region of 5×10^{-9} fatal accidents per flight hour. The most visible specialist assessment bodies assisting with this objective are Regional Monitoring Agencies (RMAs). RMAs are specifically established to undertake the ongoing monitoring of RVSM operations in order to meet the relevant ICAO Annex 11 Standard (Paragraph 3.3.5.1, which requires such monitoring be conducted on a regional basis).

For Asia/Pacific Region, RMA services are currently provided by:
- The Australian Airspace Monitoring Agency (AAMA), operated by Airservices Australia.
- China RMA, operated by the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC).
- JCAB RMA, operated by the Japan Civil Aviation Bureau (JCAB).
- The Monitoring Agency for the Asia Region (MAAR), operated by Aeronautical Radio of Thailand (AEROTHAI).
- The Pacific Approvals Registry and Monitoring Organization (PARMO), operated by the United States Federal Aviation Administration (FAA).

A typical summary of the safety monitoring results for airspace safety oversight in terms of the technical aspects and risk assessments surrounding RVSM implementation is provided in Table 1, below.

In addition, Figure 1 *(following page, top)* presents an example of the trends related to collision risk estimates for

Table 1: Summary of Safety Monitoring Results for the Western Pacific/ South China Sea RVSM Airspace

Western Pacific/South China Sea RVSM Airspace – estimated annual flying hours = 917 128 hours *(note: estimated hours based on December 2008 traffic sample data)*			
Source of Risk	Risk Estimation	TLS	Remarks
Technical Risk	0.77×10^{-9}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	2.98×10^{-9}	–	–
Total Risk	**3.75×10^{-9}**	**5.0×10^{-9}**	**Satisfies Overall TLS**

Figure 1: Trends of Risk Estimates for RVSM Implementation in WPAC/SCS Airspace

Legend:
- TLS for Total Risk (red dashed)
- Total Risk (tan circles)
- TLS for Technical Risk (light blue dashed)
- Technical Risk (blue circles)

Y-axis: 0.0E+00 to 6.0E-09
X-axis: Oct-08, Nov-08, Dec-08, Jan-09, Feb-09, Mar-09, Apr-09, May-09, Jun-09, Jul-09, Aug-09, Sep-09
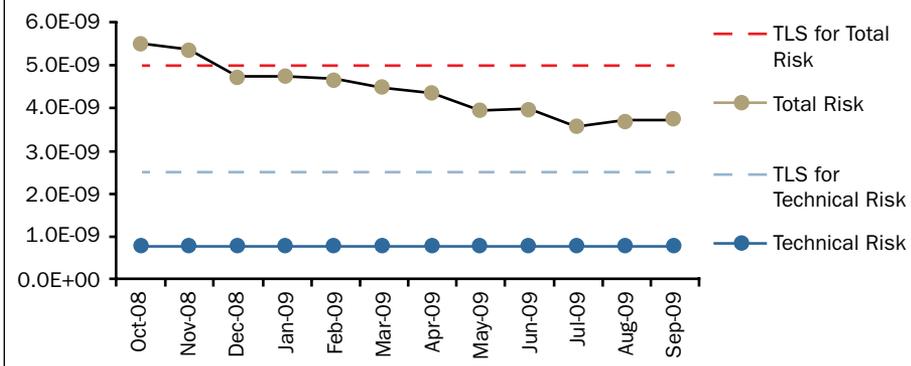
each month, based on the cumulative large height deviation (LHD) reports covering a 12 months period.

In the APAC Region, both the technical and the total collision risk estimates reported to RASMAG satisfied the agreed TLS value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour, except for one FIR.

With respect to safety monitoring of horizontal airspace, the South East Asia Safety Monitoring Agency (SEASMA) is the En route Monitoring Agency (EMA) covering operations on the six major ATS routes in South China Sea airspace. It determines compliance with APAC safety goals for the established lateral and longitudinal separation standards. The estimates relating to both lateral and longitudinal risk showed compliance with the respective TLS value during all months of the monitoring period.

AIDC Implications for Large Height Deviation (LHD) Occurrences

The introduction of AIDC messaging capability between Area Control Centres (ACCs), enables automated system messaging which eliminates human-to-human coordination exchange errors.

AIDC has now been successfully implemented between several APAC countries. Japan and its neighbouring States have made use of AIDC capabilities since 2009. It reported its findings on the resultant effect on the

number of LHD occurrences to RASMAG, based on the record of LHD events caused by ATC unit-to-unit coordination errors which occurred between aircraft crossing their FIR boundary.

As expected, the introduction of AIDC allowed for a significant reduction of the number of LHD occurrences. RASMAG and the RMAs will continue to undertake this analysis given that more APAC AIDC systems are expected to become operational in the near future.

RVSM Non-Approved Operators Using RVSM Airspace

Another concern being assessed by RASMAG relates to RVSM operations by non-approved aircraft. APANPIRG previously expressed serious concerns regarding flights that were apparently using RVSM airspace when they did not actually have State approval(s) to do so. In agreeing that the issue ultimately required regulatory intervention, APANPIRG requested RASMAG to continue its investigations in this regard.

In practice, some operators are simply and customarily filing a flight plan indicating that RVSM has been approved. They utilize RVSM airspace despite the fact that the operator is flying a non RVSM-approved aircraft. To assist in resolving these types of issues, as well as to provide better oversight for controllers, RMAs (e.g. China RMA) are putting plans into action to establish a system which will identify non-approved

aircraft using their RVSM airspace. The monthly check carried out by Australia, in January 2009, while identifying a number of 'rogue' aircraft, revealed a number of issues related to the approvals database held by the State authority. This was due in part to delays in having that database updated following the issuing of approvals to operators. Pro-active discussions between the AAMA and the State authority led to these database issues being effectively resolved, as evidenced in the significant reduction in the number of rogue aircraft identified in subsequent months.

Unified Approvals Database

In regard to the occurrences of non-approved aircraft identifying themselves as RVSM-approved on flight plans, some air navigation service providers (ANSPs) expressed a need for rapid access to approvals databases to ascertain the approval status of specific aircraft. This will not involve automatic checking of the approvals status of every aircraft, but it would allow ANSPs to request a check and receive a response within a few minutes when a specific aircraft's approval status was in question. Combined approvals databases would make such a process, if agreed to, simpler to establish and operate.

Where a single organization provides both RMA functions for RVSM operations and EMA functions for the reduced horizontal separation component, it may be feasible to combine the RVSM, PBN and data link approvals databases. This will make a single record for each aircraft possible and avoid the duplication of the nine or more fields of common data for aircraft that can currently arise, such as aircraft type, operator and the State of Registry. A combined RVSM, PBN and data link approvals database will allow States to provide approvals data to a single monitoring agency, the data being subsequently distributed to other agencies through the monitoring agencies' data exchange mechanism. ■

Effective Global Leadership
Through Balanced Priorities

The International Civil Aviation Organization

Fiji Civil Aviation Systems:
A Model for Small and Developing Economies

Fiji is part of the South Pacific group of islands and is separated from the rest of the world by vast oceanic distances. It is approximately 1,770 kilometres north of New Zealand and a four hour flight from Sydney. In-spite of this isolation, Fiji continues to safely manage one of the largest oceanic Flight Information Regions (FIRs), covering 6.5 million square kilometres of airspace.

Fiji hosts a major mainstay of the aeronautical information network in the Asia-Pacific (APAC) Region, and is currently upgrading its CNS/ATM aeronautical telecommunication network (ATN) infrastructure and automated message handling system (AMHS). This will be accomplished through the implementation of the best technological solutions available.

Fiji has reformed its civil aviation institutions on the basis of ICAO's prescribed model of separation for State and civil aviation institutions. Fiji's Civil Aviation Reform objectives are targeted to achieve more effective safety and security oversight of its key civil aviation systems. This fulfills or surpasses its international obligations with respect to an effective regulatory framework supporting more efficient air navigation service delivery to better meet the needs of pertinent air transport operators and other stakeholders.

Tourism is one of Fiji's key industries and air transport is essential to this sector's ongoing success and profitability. Fiji's national airline, Air Pacific, operates a fleet of three Boeing B737NGs, one B767 and two B747-400s. The Air Pacific network extends to Los Angeles, Hong Kong, several destinations in Australia and New Zealand, and others in the South Pacific region. Air Pacific's subsidiary, Pacific Sun, services the domestic and South Pacific region with two ATR-42 aircraft. Domestic air transport is also supported by other local carriers, with some 40 operational aircraft out of 64 currently active on the Fiji civil aircraft register.

Civil Aviation Institutional Reform

The Fijian Government's Civil Aviation Institutional Reform programme was concluded on 31 May 2010. Under these reforms, the Civil Aviation Authority of the Fiji Islands (CAAFI) became an autonomous authority, responsible for all aviation safety and security oversight.

The Fijian government, in response to the recommendations of the ICAO USOAP mandatory audit in 2001, the follow up audit in 2003, and the USOAP Comprehensive Systems Audit in 2006, approved an independent and sustainable source of funding for CAAFI. This arrangement demonstrates the State's commitment to CAAFI as the Authority seeks to realize its Vision to be a model regulator and it's Mission to carry out effective safety and security oversight in Fiji and the Region. The achievement of these goals fulfills or surpasses its international obligations under the Chicago convention. CAAFI has also obtained ISO 9001/2008 certification to improve its internal processes in support of its primary objectives.

As part of this programme Airports Fiji Limited (AFL) became a fully owned Government Commercial Company in 1999 responsible for providing air navigation services and managing the Nadi FIR oceanic airspace under contract with ICAO. AFL owns two international airports and manages 13 other domestic airports on behalf of government. The State, through the Ministry responsible for Civil Aviation, retains the responsibility for economic regulation and aircraft accident investigation. Meteorological requirements are provided by Fiji Meteorological Services, which is a separate entity under the Ministry responsible for Land and Sea Transport.

Search and Rescue (SAR) activities are undertaken by Airports Fiji Limited, with the Fiji Navy being responsible for overall coordination of SAR operations within Fiji's maritime boundaries and within State territories comprising the broader

FIR boundaries. Land-based SAR operations are coordinated between the AFL, CAAFI and the Fijian Police Force.

Safety Management Program

Fiji has been progressively implementing an effective Safety Management System (SMS) across its Civil Aviation industry since 2007. The System employs ICAO's four-phased approach. Fiji's international and national airline, Air Pacific, has fully implemented the associated SMS requirements. Fiji has also begun development on its State Safety Programme (SSP) and expects to fully implement this framework in the near future to supplement the Operators/Service Providers' SMS. Fiji is presently coordinating in-country SSP training with ICAO for delivery in September 2010. To support this work, the ICAO Integrated Safety Management Section facilitated and successfully conducted an in-country SSP Implementation training in Fiji in September 2010.

National Performance Objectives for ANS

Regional performance objectives presently include improvements to air navigation systems that are required to evolve Fijian Air Traffic Management (ATM) in support of ICAO's Global Performance Objectives. These objectives are in keeping with operating environments and priorities specific to Fiji's Regional responsibilities.

Fiji has adopted the recommended APAC Regional Performance Objectives as the basis for its own National Performance Objectives. This will enable the State to achieve an interoperable global air navigation system for all users during all phases of flight, one that meets agreed levels of safety, provides for optimum economic development, is environmentally sustainable and meets national all pertinent international and national security requirements.

Air Navigation Regulation and Harmonization

Fiji has updated its legislation to incorporate recent ICAO Guidance as highlighted in the 2006 USOAP audits. One prominent change is the promulgation of the new Civil Aviation Occurrence Reporting and Investigation Regulations to incorporate the requirements of Annex 13. In particular this includes provisions for transparency and the sharing of safety information, as well as the protection of same from inappropriate use.

The Fijian Government has also endorsed the harmonizing of its Air Navigation Regulations with globally acceptable norms, employing the NZ CAA Rules as the basis for this evolution. This is in-line with the recommendations of the ICAO TCB CAAFI Review Report and ICAO Resolution A29-3. An Integral part of Fiji's legislation development is the formulation of a new consultation mechanism which includes stakeholders in the process.

Upgrade and Modernization of CNS/ATM Equipment and Infrastructure

In July 2010, Fiji's Air Navigation Service Provider, Airports Fiji Limited (AFL), commissioned one of the more advanced, highly configurable Air Traffic Management (ATM) systems in the world—the Aurora system. This technology is already being employed in adjacent FIRs by the US Federal Aviation Administration and Airways New Zealand, and will provide AFL with equivalent oceanic ATM capabilities.

Fiji also has plans to integrate its Aurora ATM automation with a fully comprehensive, operational ADS-B solution that will enable AFL to move from procedural to radar-like separation standards within its domestic airspace with no reliance on radar.

According to ATC *Global Insight Newsletter 59:* "Fiji has completed the cut-over of the new AMHS/ATN and AIS system delivered by Comsoft. The system includes Comsoft's CADAS AIS system to manage NOTAM- and OPMET-related information. Fiji connects the ICAO Regions of Northern America and Asia-Pacific and is one of the five designated Asia/Pacific Regional OPMET data banks responsible for the management of OPMET bulletins. Fiji is still connected to its communication partners via AFTN, but is ready to establish operational AMHS connections to Australia and the United States. Fiji AIS is also prepared for an upgrade to a fully integrated AIM solution on the basis of the emerging AIXM 5.1 standard. AIXM 5.1 combines static and dynamic AIS data and is needed to support future Digital NOTAMs".

Aviation Security

Aviation Security is the responsibility of the State, and the Civil Aviation Authority of the Fiji Islands was designated by its government as the appropriate authority responsible for the oversight of the State's civil aviation security systems. The security requirements are published in the National Civil Aviation Security Programme, the National Civil Aviation Quality Control Programme, and the National Civil Aviation Security Training Programme. All of these programmes are supported by the Civil Aviation Security Act and Regulations.

Fiji has additionally implemented security requirements for operators, ground handlers, catering service providers, cargo operators, regulated agents and access control. The Fiji Civil Aviation Security System was audited under the ICAO USAP in 2007 and a follow-up audit was conducted in 2009.

Fiji has now implemented 93% of all the USAP recommendations. Facilitation remains the responsibility of its government and both security and facilitation issues are managed under the National Civil Aviation Security and Facilitation Committees. ∎

The Asia-Pacific Flight Procedure Programme

The Asia-Pacific Flight Procedure Programme (APAC FPP), which became operational in March of 2010, is the first of a new breed of ICAO Technical Co-operation programmes. Conceived and developed by ICAO in response to the critical needs identified in the Region by the ICAO Asia-Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) Performance-Based Navigation (PBN) Task Force, the APAC FPP aims to provide the tools, training and assistance necessary to accelerate PBN implementation and achieve the goals set-out in Assembly Resolution A36-23.

As David VanNess, ICAO's FPP Manager in Beijing reports, achieving the A36-23 goals is not an end in itself so much as a great step forward in making global progress with respect to aviation safety, efficiency and environmental improvements. The APAC FPP is poised to assist Regional stakeholders as they seek to more safely and efficiently manage the highest aviation growth rate in the world and meet the challenges required head-on in order to take this huge step forward.

Dave VanNess is an Airline Pilot with extensive experience in international operations. He is also a helicopter pilot, certified flight inspector and procedure designer. He was manager and Chief Pilot of the FAA International Flight Inspection Office for six years. His last job with the FAA was as Manager of the Eastern Flight Inspection Service Area in the FAA Air Traffic Organization. As Implementation and Resource Development Coordinator for Performance-based Navigation at ICAO HQ from 2007 to 2010, he played an instrumental role in the preparatory work to establish the APAC FPP. He is now with ICAO in Beijing as Manager of the FPP.

The ICAO Air Navigation Commission visits the first FPP Procedure Designer class in Beijing, 6 July 2010.

The APAC Flight Procedure Programme (FPP) is envisioned to be a centre of excellence in the field of flight procedure design. It will help to develop Regional State capabilities in the instrument flight procedure domain—most especially in the areas of both procedure design and regulatory oversight of pertinent service providers. The FPP will employ best practices in training, automation and quality assurance, using experts in the field to address the procedure design needs and enhance the capabilities of participating States.

The APAC FPP has been organized by ICAO as a Regional Technical Co-operation programme. This means that States in the Region join together to fund the programme and, in return, can use the services, tools, training and assistance provided by the FPP.

APAC States agreed that a core group of Active Participating States would oversee the FPP as members of its Steering Committee and jointly fund the programme. Other States in the Region could choose to join as User States, with no contribution required, and make use of the programme's free services such as training and technical assistance.

One of the reasons that this Active/User State approach was considered feasible due to the fact that the programme has attracted global interest and contributions accounting for approximately 75 percent of the resources required to establish and operate it during its first three-year cycle. These contributions or commitments of resources, either in-kind or in cash, have come from the FAA, France's DGAC, Airbus, CAAC, Hong Kong CAD, and others.

As of this writing there were nine Active Participating States and eight User States in the APAC FPP. States in the APAC Region that are not already members can join at any time by signing the FPP Programme Document and deciding whether they wish to join as an Active Participating State or User State.

First Year of Operations

The APAC FPP operates from offices provided by the CAAC Center for Aviation Safety Technology (CAST) in Beijing, China. The operation is presently run by a Manager and five staffers, one of whom is a procedure design instructor and FPP Chief of Training—the FPP's main focus during its first year.

Since the office's opening in March, FPP employees were busy preparing for the PANS OPS Procedure Design Initial Course that was held in June-July 2010 in Beijing. That four week course, delivered to fifteen students from eight States, proved very successful and in fact had 60 percent more applications than there were seats available. Instructors for this course and future offering are drawn from a pool of procedure design instructors in the Region who underwent training in the ICAO/ENAC PBN Procedure Design Instructor Course in 2009.

Additionally, in April 2010, the FPP conducted a Workshop on Continuous Descent Operations for FPP staff and 15 attendees from China. The next FPP course offering will be the PBN Procedure Design Course to be held September 1-17, also in Beijing. Other offerings planned for the first year are Procedure Design On-the-Job Training, an RNP AR Procedure Design Course, and PBN Airspace Concept Workshops.

In addition, the FPP will be looking to accept one or two procedure design projects on a for-fee basis during its first year, if opportunities allow. ∎

ICAO Secretary General Raymond Benjamin and CAAC Deputy Administrator Li Jian unveil the FPP plaque at the formal opening ceremony of the APAC Flight Procedure Programme.
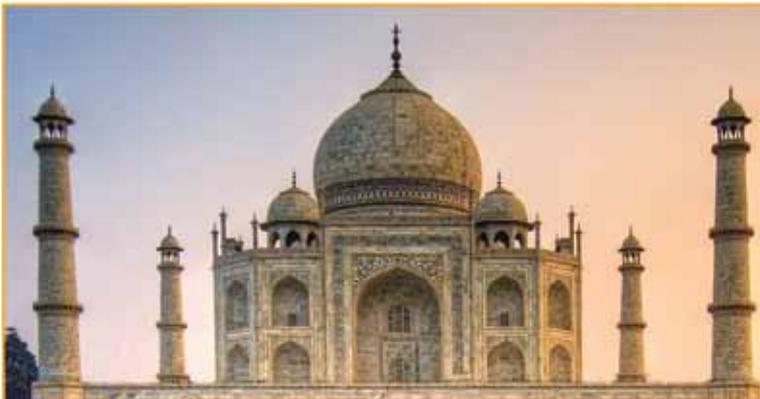
Communicable Diseases and Air Travel: The APAC Perspective

N.C. Sekhar joined the ICAO APAC Office in November 2006 as Regional Officer/AGA.

The spread of severe acute respiratory syndrome (SARS) in 2003 raised concerns for ICAO, the World Health Organization (WHO) and a number of States and Special Administrative Regions (SARs) in South East Asia. This led to the development and implementation of Anti-SARS protective measures and guidelines at certain airports as a means of controlling the disease and preventing its spread through air travel. The SARS outbreak had devasting effects on air traffic to, from and within the affected areas.

The onset and widespread effects of avian Influenza in 2005 raised even greater concerns regarding the possibility of a human pandemic. The unpredictable behavior of this influenza virus was a challenge, as neither the timing nor the severity of the next pandemic could be predicted with any certainty.

In 2006, ICAO established the Cooperative Agreement for Preventing the Spread of Communicable Diseases through Air Travel (CAPSCA) aimed at reducing the risk of spreading avian influenza and similar communicable diseases by air travelers through cooperative arrangements between the participating States/Administrations and airports. This would be achieved initially by the application and implementation of ICAO guidelines.

The CAPSCA project provides on-site training in the public health domain at major international airports in participating States. ICAO guidelines for States are available via the ICAO Web site. To date, China, Hong Kong China, Indonesia, Macao China, Malaysia, Mongolia, Nepal, Papua New Guinea, The Philippines, Singapore, The Solomon Islands, Thailand, Tonga, and Vietnam have joined this cooperative arrangement.

The first Steering Committee Meeting (SCM) of CAPSCA was held in Hong Kong China in August 2007, the second SCM was held in Indonesia in June 2008, and the third SCM was held in Macao China in June 2009. A Regional Aviation Medicine Team (RAMT) has now been established by the SCM.

Three RAMT meetings have also taken place in Bangkok: one in October 2007; the next in Sept 2008; and the most recent in September 2009. The Fourth Meeting of the CAPSCA Steering Committee and Workshop/Seminar on Aviation Business Continuity Planning was held recently in Kuala Lumpur, Malaysia, from 24–26 May 2010.

The next major event in this field will be the Global RAMT from October 15–16 2010. It will be held at the Singapore Aviation Academy and will aim to ensure the worldwide coordination of technical CAPSCA project activities.

ICAO has developed a template for a National Aviation Preparedness Plan, which will be presented at the upcoming APAC Regional Aviation Medicine Team Meeting in October 2010. ICAO will continue to work with airline and airport operators, international organizations, experts and governments to ensure that involvement and coordination continues regarding preparedness for pandemic influenza and to maintain the continuity and safety of air travel in general. ∎

ICAO's Global and Regional Initiatives

Article 14 of the Chicago Convention on International Civil Aviation requires each contracting State to take effective measures to prevent the spread of communicable diseases by means of air navigation. ICAO, in coordination with its Member States, has developed *Preparedness Planning Guidelines (Aviation Aspects) for a Communicable Disease of Public Health Concern* to prevent the spread of avian influenza and similar communicable diseases by air travelers and to mitigate the socio-economic consequences.

RECENT CHANGES TO HEALTH-RELATED ICAO PROVISIONS

- **Annex 6—Operation of Aircraft**
  An aeroplane shall be equipped with accessible and adequate medical supplies. On board medical supplies should include a 'Universal Precaution Kit'.
- **Annex 9—Facilitation**
  A Contracting State shall establish a National Aviation Plan in preparation for an outbreak of a communicable disease posing a public health risk or public health emergency of international concern.
- **Annex 11—Air Traffic Services**
  Air Traffic services authorities shall develop and promulgate contingency plans.

Preparatory action plans should include Public Health Emergencies.
- **PANS-ATM**
  Communications procedures with affected aircraft.
- **Annex 14—Aerodrome Design and Operations**
  The Aerodrome Emergency Plan shall provide for the coordination of the actions to be taken in an emergency occurring at an aerodrome or in its vicinity. The action plan should include public health emergencies.

Leadership and Vision
in Global Civil Aviation

Building ANSP Capabilities in the Asia Pacific Region

In a Region as large and diverse as the Asia Pacific, air transport is both a driver and a beneficiary of economic growth. That APAC is today the world's largest aviation market is testimony not only to the vibrant economies of the Region but also the leadership of ICAO in the development of civil aviation.

As Chiang Hai Eng, CANSO's Director for Asia Pacific Affairs reports, with increasing air traffic there are many challenges ahead for the APAC Region that will impact flight safety and efficiency, airspace capacity as well as the environment.

Chiang Hai Eng is CANSO's Director for Asia Pacific Affairs. He was formerly Chief Corporate Officer and Deputy Director General of Operations with the Civil Aviation Authority of Singapore. Chiang was a member of the ICAO Committee on Future Air Navigation Systems and a former Vice Chairman of the ICAO Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG).

The key to a safe, efficient and sustainable future for aviation lies not only in investments in technology and infrastructure, but perhaps even more importantly in greater collaboration among all our sector's stakeholders.

International aviation transcends national boundaries. The challenges it faces, therefore, cannot be overcome by a single State or Air Navigation Service Provider (ANSP) acting in isolation. As the 'Global Voice of ATM', CANSO's key priority in the Asia Pacific is to reach out to ANSPs in order to facilitate and inspire more effective cooperation and collaboration and thereby significantly improve overall ATM performance in the Region.

Promoting Industry Best Practices

CANSO's global vision is one of a seamless, safe and efficient airspace. It aims to complement the leadership role of ICAO by bringing additional industry perspective to Regional processes and decisions. With ICAO focused on the regulatory aspects of what needs to be done, CANSO can play its part by sharing industry experience and expertise on how best to go about achieving our Region's shared objectives. With over 100 members worldwide, CANSO is well-placed to help Regional ANSPs benchmark their performance against best-in-class indicators and to implement industry best practices through its network of expert committees and workgroups. More and more today, this sharing of data and knowledge is happening through the simple click of a mouse.

CANSO recently held two high-level APAC ANSP conferences to engage CEOs and ATM leaders concerning their most pressing challenges. As a result of these conferences, CANSO is now focusing its attention on the priority areas of Safety and ATM Operations and will be addressing pertinent topics with local stakeholders through a series of seminars and workshops. One such example was the Regional workshop conducted last year on CANSO's Standard of Excellence for Safety Management Systems (SMS).

This year, CANSO will be holding its annual Global ATM Safety Conference, which will include safety workshops for APAC ANSPs on SMS implementation. With the support of its Operations Standing Committee, CANSO will also be holding an Asia Pacific ATM Operations Best Practices Seminar aimed at improving operational efficiency for all phases of flight.

Promoting ADS-B Implementation through Regional Collaboration

CANSO has also teamed up with IATA to promote the implementation of ADS-B in the APAC Region. Apart from substantial savings in costs and aircraft emissions through

Figure 1: Examining fuel savings from flights that are delayed or did not receive their optimum flight altitudes
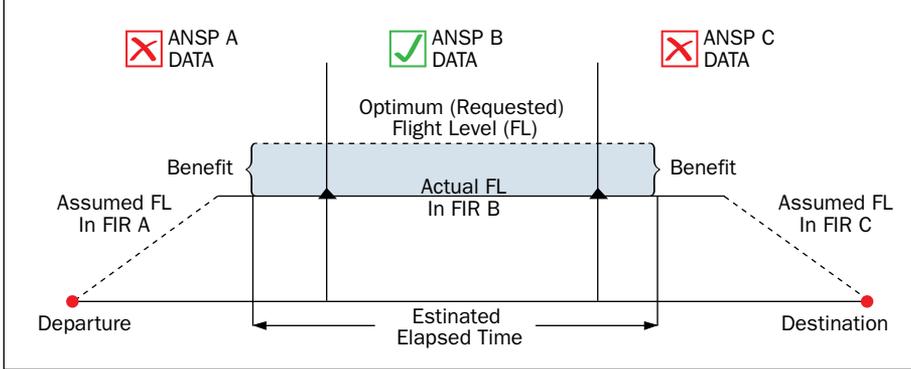
improvements in airspace capacity and operational efficiency, ADS-B surveillance also enhances safety in airspace that is outside radar coverage. This project highlights firstly the cost/benefits of ADS-B as a building block of future ATM systems, and secondly the need for and benefits from closer collaboration amongst APAC ANSPs.

The initial phase of the ADS-B project involves the ANSPs of Indonesia, Singapore and Vietnam. It covers two trunk routes (L642 and M771) and several subsidiary routes. The South China Sea airspace was identified for this exercise as it contains some of the highest density traffic routes which will benefit most from ADS-B surveillance capability.

Table 1: Results of Cost Benefit Study

	Most Likely Estimate		
Demand Growth	3%	5%	7%
Costs FY09 $M	$45.66	$45.66	$45.66
Benefits FY09 M$	$127.96	$200.47	$328.11
IRR	17%	22%	27%
Costs PV	$27.17	$27.17	$27.17
Benefits PV	$50.29	$73.60	$112.43
NPV	$23.12	$46.43	$85.26
B/C Ratio	1.9	2.7	4.1
Payback Year	2020	2018	2017

The cost benefit study which CANSO has conducted is based on several assumptions, most important of which is that ADS-B data and VHF communications will be shared amongst the relevant ANSPs. This need for closer Regional collaboration is crucial to the operational assumption that radar-like separation will be implemented in exclusive airspace for suitably-equipped aircraft. These prerequisites underline the importance of Regional collaboration amongst ANSPs, without which the installation and operation of ADS-B stations alone would not amount to much in the way of realizable benefits.

The benefits that were realized in the course of this study included savings in aircraft fuel burn arising from the availability of optimum flight levels, reductions in airborne and ground delays, reductions in carbon emissions and reductions in flight delays. Together these point to important aggregate savings in Aircraft Direct Operating Costs and Passenger Value of Time.

This study, which was completed in mid-2009, revealed an internal rate of return for the APAC Region of 22 percent for a projected medium-term traffic growth rate of 5 percent. It projects annual savings of 3 million pounds of fuel burn, annual reductions of about 10 million pounds of CO_2 emissions, and total economic savings of $4 million annually.

These savings are significant considering that the study was limited to only two trunk routes. One can imagine what the benefits would be if CANSO were to expand the project to include airspace over the rest of the South China Sea, the Bay of Bengal and other parts of the APAC Region.

The ANSPs concerned must now move quickly to deliver the operational and economic benefits identified in the study. There are several key tasks which have to be accomplished by the ANSPs apart from equipment installation, such as agreements to share ADS-B data and VHF communications, safety assessments and the issuance of an aircraft equipment mandate.

Vision is Global but Implementation is Local

CANSO opened its Asia Pacific Office in Singapore in 2008—its first Regional office outside of Europe. This was followed by a Middle East Office in Jeddah in 2009 and, in June this year at its Annual General Meeting, CANSO announced the establishment of an Americas Office in Mexico.

The opening of these Regional offices in quick succession recognizes the need to address ATM issues at the Regional level and acknowledges the fact that 'one size does not fit all'. CANSO's vision is for a seamless, safe and efficient airspace system but to achieve that global vision, implementation will have to start locally with the ANSPs in their respective Regions.

As CANSO's Asia Pacific Office completes its second year of operation, we look forward to working even more closely in the future with ICAO and all the ANSPs and stakeholders of this dynamic and rapidly expanding Region. ◼

Advancing Regional and Global Safety Objectives Through Improved Sub-regional Cooperation

The activities of ICAO's main work programme related to the setting of international Standards and Recommended Practices (SARPs) to support international aviation are well known. Another area of activity playing an increasingly important role in the Organization's activities today involves the work of Cooperative Development of Operational Safety and Continuing Airworthiness Programmes, or COSCAPs.

COSCAPs have been established as self-sustaining sub-regional cooperatives to support and improve aviation safety and efficiency among participating States. In this special update for the APAC Regional Report, Kim Trethaway, Chief Technical Advisor and Flight Operations Expert for the ICAO COSCAP North Asia, provides updates on his own sub-regional group as well as two additional Asia/Pacific COSCAPs in South and South East Asia.

Kim Trethewey is the Chief Technical Advisor, Flight Operations Expert, for the ICAO COSCAP North Asia project based in Beijing, China, a position that he undertook in February 2008. Before joining the Canadian Department of Transport in 1985, Tretheway's piloting career included instruction, regional airline and corporate operations, as well as responsibilities as a training pilot and Chief Pilot. His last assignment before joining the COSCAP programme involved implementation of safety management systems in the Canadian airline sector.

Findings from the ICAO Universal Safety Oversight Audit Programme (USOAP) have demonstrated that many States find it difficult to adequately meet their safety oversight obligations. A solution which has proven to be successful in the Asia-Pacific (APAC) Region has been the establishment of Cooperative Development of Operational Safety and Continuing Airworthiness Programmes (COSCAPs) to assist partici-pating States in their ongoing efforts to strengthen their safety oversight capabilities.

COSCAPs are dedicated forums for cooperation and coordination in matters related to flight safety, bringing together both well developed and smaller participating civil aviation administrations. Each COSCAP operates independently under the direction of a Steering Committee comprised of the Directors General of participating Civil Aviation Authorities (CAAs), ICAO, as well as other organizations and companies interested in supporting aviation safety. The Steering Committees establish priorities for their respective programme, providing higher-level direction to a programme coordinator who is responsible for developing specific work plans to support the needs of all participating States.

An important feature of the COSCAPs is that they are funded by the participating States themselves, with additional support from safety partners—either in cash or in kind. APAC Regional safety has benefited tremendously through the generous financial and technical support provided by Canada, the European Commission, France, Norway, United States, Airbus, Boeing, Bombardier, the Association of Asia Pacific Airlines (AAPA) and IATA, as well as Regional air operators who provide free transportation to COSCAP personnel.

There are now three COSCAPs operating in the APAC Region: COSCAP South Asia; COSCAP South East Asia and COSCAP North Asia.

COSCAP South Asia's Member States are comprised of India, Bangladesh, Pakistan, Bhutan, Nepal, Maldives and Sri Lanka. It is the most mature of the APAC COSCAPs, currently operating based on the priorities of its third five-year term.

COSCAP South East Asia is comprised of Cambodia, Hong Kong (China), Macao (China), Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam, Brunei Darussalam and Timor-Leste. It was established in 2001 and is in its second five-year term.

COSCAP North Asia, meanwhile, comprises China, the Republic of Korea, the People's Democratic

APAC
Regional Office
Members of
Our Team

Republic of Korea and Mongolia. It was established in 2003 and is in its second five-year term.

Each of these programmes initially concentrated on inspector training and core oversight programme development, along with safety team work to prevent accidents though the identification and implementation of critical safety enhancements designed to eliminate or reduce safety risk. This work is accomplished through the combined efforts of international, national and Regionally recruited inspectors. A brief description of some this work is provided in the following paragraphs.

Development of Inspector Manuals

COSCAP programmes have developed generic policy and procedure manuals to guide inspector certification and safety oversight functions. These manuals can be easily adapted by Member States.

Development of Regulations, Standards and Policy

While some COSCAP programmes work towards the harmonization of regulations and standards, this is generally not a priority of most programmes as many Member

Administrations have well established regulatory frameworks. Instead, new regulatory requirements are developed in a harmonized manner.

A recent example is the implementation of new ICAO Annex 6, Part I—*International Commercial Air Transport*—Aeroplanes provisions related to the approval and surveillance of foreign air operators. In this case the APAC COSCAPs jointly developed model regulations, a model Foreign Air Operator Validation and Surveillance Manual, and associated training. Similarly, extensive work is underway in 2010 to support operational approval of Performance-Based Navigation (PBN). Although there is a great deal of international PBN expertise and supporting ICAO documentation, the COSCAPs identified a remaining area of common need—support for CAAs as they develop the regulations, policy and procedures needed before they can approve the use of the highly-anticipated PBN procedures.

Training Programmes

The Steering Committees have assigned a high priority to the training and development of national inspectors. Where numbers warrant, training programmes can be provided in all

States, but often are provided at one or two central locations. While COSCAP staffers provide the majority of the training, in many cases donors will provide additional training programmes at no cost to the programme. Air operators and service providers are often invited to send participants to the training programmes so as to ensure a common understanding of regulatory requirements and to foster good working relationships.

Audits, Inspections and Certification Activities

This is an area where the needs of Member States vary widely, and COSCAP staff may assist States with audits, inspections and certification activities, including on-the-job training for national inspectors.

Technical Assistance

COSCAP staffers are often asked to provide guidance on the interpretation of regulations/standards, best practices, and/or technical matters. Considerable assistance has been provided to support Member Administration preparation and responses to ICAO USOAP requirements.

Regional Aviation Safety Team (RAST)

Each COSCAP established a Regional Aviation Safety Team whose first task was to review safety interventions which have already been developed through the efforts of well-established multinational safety groups. The RASTs also focus on flight safety concerns particular to the Region. RAST priorities and methodologies for implementing the safety interventions, once approved by the Steering Committee, are implemented through the coordinated efforts of the regulatory authorities in cooperation with the airlines, service providers and the aircraft manufacturers.

Originally operating independently, each RAST enjoyed the support of a number of safety partner organizations. Recognizing that the RASTs had a great deal in common, the three separate

RASTs were combined as the Asian Regional Aviation Safety Team (ARAST) in 2008, providing the benefits of wider participation, a greater sharing of safety information and efficiency for members and donors alike. Thereafter, the ARAST became the primary forum to support Regional implementation of the ICAO Global Safety Initiatives (GSIs) and best practices concurrent with the ICAO Global Aviation Safety Plan and the Global Aviation Safety Roadmap.

Building on the work of the U.S. Commercial Aviation Safety Team (CAST) and the European Strategic Safety Initiative (ESSI), the ARAST has worked to implement safety enhancements to reduce the risk of fatal accidents arising from the top accident categories, including: Controlled flight into terrain; approach and landing accidents; and loss of control.

Of the 72 CAST safety enhancements, the ARAST has addressed 40 for implementation in the Region. Among other actions this has included the issuance of 23 Advisory Circulars and Advisory Bulletins.

Challenges

While the COSCAPs and the safety teams have been effective in addressing many areas requiring action, there are a number of common challenges that remain, including:
- Funding and contributions are difficult to establish and to maintain.
- Balancing benefits to States.
- Capabilities of Member States may be very diverse.
- Implementation of lessons learned is not always successful in all States.
- Limited resources require the COSCAP programmes to take a long term outlook.

COSCAP Benefits

The Asian COSCAPs have proven to be an efficient and cost-effective means of providing expert support, which is of crucial importance given the scarcity

and high cost of international expertise. COSCAP personnel are familiar with Regional issues and available resources and are able to respond quickly to urgent requests for assistance.

The ability to provide training on specialized subjects at relatively low cost to a large number of participants has been a significant achievement of the COSCAP initiative. This capability also supports the establishment of a more harmonized regulatory regime across the Region. The international donor community, which has a vested interest in promoting flight safety globally, has recognized the inherent efficiencies of the COSCAPs and has demonstrated this through their strong and generous support for the Programmes—both in cash and technical expertise.

Conclusion

The practical benefits of the APAC COSCAPs have been clearly demonstrated, as has the resolve of COSCAP Member States to enhance aviation safety through more effective Regional cooperation. The Asian Regional Aviation Safety Teams (ARAST) is a high priority activity and it provides a forum to develop safety interventions that are based on a detailed review of accident data from a risk management perspective. Overall, the diverse capacities of the APAC COSCAPs ensure a more effective and efficient use of all safety resources. ■

Bird Strike: The APAC View

Birds have posed a potential hazard to aircraft since the first days of air travel. What was once a minor risk to the relatively small amount of early, slow-flying aircraft has today become a significant safety issue due to the dramatically increased airspeeds and much quieter engines of modern civil, military and commercial fleets.

Increases in the populations of many bird species has compounded these factors, making bird strike a much more significant threat to modern aviation safety. As N.C. Sekhar reports, ICAO's APAC Regional Office, in close association with the FAA and DCA Malaysia, will be holding a seminar in December 2010 on Wildlife Control and Management to address the more local aspects of this worldwide safety issue.

N.C. Sekhar joined the ICAO APAC Office in November 2006 as Regional Officer/AGA.

Bird strikes are extremely expensive to modern aircraft operators. The associated costs of down-time for inspection and repair following bird damage, the rescheduling of flights, transfers of passengers to alternative means of transport and overnight accommodation can be significantly damaging to both airline operating budgets and to public perceptions of the safety and viability of air travel.

Airports tend to be surrounded by an environment that attracts and supports birds and other wildlife. Rodents, insects and other small animals are a source of food for these animals and these are often found on and alongside grassy runway strips.

"A total of 6,996 bird strikes were reported by 18 States in the APAC Region during the ten-year period from 1996–2006. Bird strikes occurred throughout the year with two peak periods: from April to May and from September to October. The months with the least reported strikes were February and July."

Further problems may arise when an airport is located on a bird migration route. Airport planners sometimes overlook this safety factor, but it's generally more the case that these routes arise unexpectedly due to a bird species having found an attractive new food source.

Birds may also be attracted to pig farms where garbage is used as fodder. Even tree plantings can present a hazard if the species provides an attractive food source or nesting habitat. Moreover, airports tend to provide a safe haven for many birds from their natural predators.

Bird Strikes and APAC

A total of 6,996 bird strikes were reported by 18 States in the APAC Region during the ten-year period from 1996–2006

Bird strikes occurred throughout the year with two peak periods: from April to May and from September to October. The months with the least reported strikes were February and July.

The phases of flight during which bird strikes were most frequent were approach (28 percent), landing roll (30 percent), take-off run (29 percent) and climb (10 percent). Taken together, these four phases which happen on or in the vicinity of an aerodrome account for almost 97 percent of all reported bird strikes. Eighty-five percent of the reported bird strikes occurred within 30 metres of ground level.

With respect to the aircraft itself, the areas most often struck by birds include the nose (five percent), wing rotor (25 percent), windshield (four percent), landing gear (four percent), fuselage

Some examples of the damage that can be caused to aircraft and engines as the result of bird strikes. A total of 6996 bird strikes were reported by 18 States in the Asia/Pacific Region between 1996–2006.

Figure 1: APAC bird strike data for the period 1996–2006. The phases of flight during which bird strikes were most frequent were approach (28 percent), landing roll (30 percent), take-off run (29 percent) and climb (10 percent).
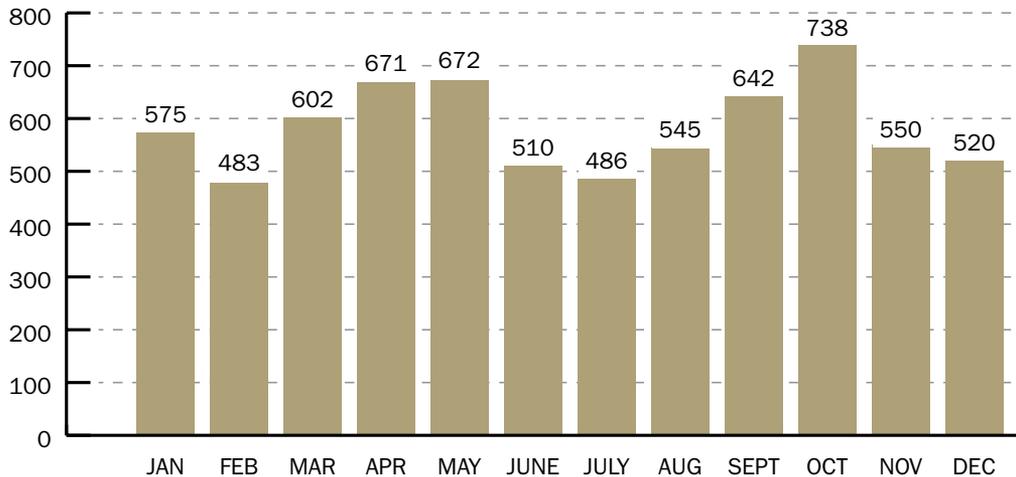
(three percent), radome (six percent), engine number one (24 percent) and engine number two (12 percent).

A total of 2,179 reports were received regarding damage caused by bird strike to aircraft. Of these, 121 or six percent of these strikes caused minor damage, with another 64 (three percent) experiencing substantial damage. The remaining 1,994 strikes did not caused any damage to the aircraft.

Related ICAO Provisions

ICAO recognizes the hazard birds pose to aircraft and requires airport authorities to adopt measures to minimize the likely hood of collisions between birds and aircraft at, or in the vicinity of, the airport. To this end, ICAO has established Standards and Recommended Practices (SARPs) for bird/wildlife hazard reduction in Annex 14, Volume I—*Aerodrome Design and Operations.*

In addition, ICAO provides the guidelines and information necessary to develop and implement an effective bird control programme for an airport. In Part 3 of ICAO's *Airport Services Manual, Bird Control and Reduction*, the importance of good organization and planning is

stressed in the creation of a successful bird control programme. The Manual also deals with the reasons why birds occur in the airport setting and outlines the modifications which may be made by airport authorities to reduce their facilities' attractiveness to birds.

In Part 2 of ICAO Doc 9184—*Airport Planning Manual, the section on Land Use and Environmental Control* provides guidelines on land use types that may attract bird activity. It considers the compatibility and effectiveness of various activities within the area that lies between and inner radius of three kilometres and an outer radius of eight kilometres centred on a given airport facility.

The Manual on the ICAO Bird Strike Information System (IBIS) provides information and suggestions for developing effective bird strike reporting, analysis and recording systems. The IBIS programme is an excellent tool designed to collect and disseminate information on bird strikes and represents an important element in ongoing accident prevention schemes. IBIS is highly supported by airlines and other experts working to reduce the threat of bird strikes to aircraft globally.

Regional Initiatives and Goals

Recognizing the severe extent of the damage bird strikes cause to aircraft, the APAC Regional Planning and Implementation Group, during its 18th meeting, invited APAC Member States to establish a national bird control committee with a defined term of reference. Thus far 17 APAC States have established this type of committee.

The ICAO APAC Regional Office also initiated a survey to review the extent of implementation of ICAO Annex 14 requirements regarding bird and wildlife hazard reduction at and in the vicinity of airports. Furthermore, in close association with the FAA and DCA Malaysia, the APAC Regional Office has organized a seminar for December 2010 on airport wildlife control and management.

Although birds and aircraft may share the same airspace, history and evidence have now clearly demonstrated that human and animal flight are not compatible within too close proximity to one another. It is ICAO's goal and the objective of current provisions to make the skies safer for all who fly—birds and aircraft alike. ■

Global Aspirations and Regional Delivery

The Regional implementation of a number of key global MET programmes is presently proceeding on course in the APAC Region, in addition to developments related to the APAC Cooperative Agreement for the Enhancement of Meteorological Services for Aviation, Regional MET/ATM coordination activities, ongoing efforts related to Quality Management Systems, and the gradual implementation of XML-based net-centric MET data.

As Christopher Keohan reports, all of these initiatives are helping to foster a more globally-harmonized and comprehensive MET system that the APAC stakeholders are helping to move forward over the near- and mid-term.

Christopher Keohan, ICAO Regional Officer, Aeronautical Meteorology, Bangkok, has been employed at the ICAO APAC Regional Office since June 2008. Prior to this Keohan served as a senior meteorologist on wind shear systems at the Federal Aviation Administration's (FAA's) Mike Monroney Aeronautical Center (MMAC), utilizing experience gained with prototype wind shear and terminal weather systems at the Massachusetts Institute of Technology Lincoln Laboratory (MIT/LL) for several airport hub locations.

Regional meteorological (MET) activities facilitate State efforts geared towards local implementations of global MET programmes. This is primarily accomplished through consultative processes and programmes, seminars and workshops, as well as regular meetings.

WAFS

Regional implementation of the World Area Forecast System (WAFS) is necessary for providing pilots with forecasts of upper-air winds, temperatures and humidity readings for various altitudes used in flight planning. Forecast generation and global distribution are managed by two World Area Forecast Centres (WAFCs) located in London and Washington.

High altitude significant weather (SIGWX) forecasts for flight levels 250 to 630 (global), as well as medium altitude SIGWX forecasts for flight levels 010 to 250 (South Asia), are also disseminated by the WAFC to provide information on hazardous meteorological phenomena such as severe icing, turbulence and cumulonimbus clouds (CB) *(see chart on page 31)*. The medium level SIGWX forecasts also contain areas of in-cloud icing and turbulence.

Operational implementation of gridded forecasts relating to CB, icing and turbulence are expected as early as 2013 in digital form (these are currently available but only as experimental forecasts by way of the Internet). These gridded digital forecasts will allow users to more easily incorporate

related data into automated systems in addition to the wind, temperature and humidity information already provided in this manner. All WAFS forecasts will be available in three-hour time increments up to 36 hours, as opposed to the single 24-hour forecast that is currently available for SIGWX.

A workshop on the new gridded forecasts of CB, icing and turbulence is expected in the APAC Region in 2011 or 2012 to facilitate the utilizing these new forecasts by States and other end-users.

Obtaining WAFS forecasts for flight planning can now be obtained via the Internet by way of SADIS FTP (issued by WAFC London) and the WAFC Internet File Service (WIFS, issued by WAFC Washington). The use of the Internet for this type of non-time-critical MET data will be enabled in Annex 3 in November 2010.

The cessation of the International Satellite Communication Service (ISCS) second generation (ISCS-G2) device in June 2012 will require States and users to make use of the Internet for forecast data as described above. The Regional WAFS Implementation Task Force (WAFS/ITF) will monitor and assist States during the transition from satellite to Web-based forecast sources as 2012 approaches. Implementation focus will be placed on five States in the APAC Region that currently do not receive the WAFS forecasts needed for flight briefings.

IAVW

Efforts associated with the Regional implementation of the International Airways Volcano Watch (IAVW) system include State assistance programmes (eg. AusAID) for countries that are unable to provide volcanic ash information for Air Traffic Service (ATS).

Volcanic Ash Advisory Centres (VAAC) nominated in the APAC Region include Darwin (Australia), Tokyo (Japan) and Wellington (New Zealand), from which

forecasts of volcanic ash position and movement are provided to users and Meteorological Watch Offices (MWO, for the production and dissemination of volcanic ash SIGMET) and ATS by way of volcanic ash advisories.

Currently, four APAC States have demonstrated documented deficiencies in observing or disseminating information on volcanic ash to ATS and/ or the production and dissemination of volcanic ash SIGMET.

Cost recovery guidance for volcanic ash services was made available with the assistance of the Civil Aviation Authority of New Zealand (CAANZ). Other Regional activities include obtaining the eight-character AFTN addresses for all Area Control Centres (ACCs) for the dissemination of radioactive cloud information from VAAC London, beginning November 2010.

The recent eruption of the Eyjafjallajökull Volcano in Iceland, with the resulting disruption to air travel and commerce in Europe and beyond, resulted in the establishment of the International Volcanic Ash Task Force (IVATF) by ICAO on 29 April 2010 to assist in the development of a global safety risk

management framework to determine the safe levels of operation in airspace contaminated by volcanic ash.

The APAC Regional Office will monitor the developments of the IVATF, including those relating to the operational need for volcanic ash concentration maps, and utilize the Regional Meteorological Advisories and Warnings Implementation Task Force (METWARN/I TF) and Meteorology Air Traffic Management Task Force (MET/ATM TF) in developing a framework of a Regional contingency plan that addresses large scale events such as volcanic ash, tropical cyclones, Tsunamis and radioactive clouds. Implementation issues associated with new requirements developed by ICAO will be addressed by these task forces.

ITCW

Regional implementation of the International Tropical Cyclone Watch (ITCW) is crucial in the APAC Region, given that tropical cyclones may occur any time of the year and severely impact busy air routes and aerodromes.

Coordination with Tropical Cyclone Advisory Centres (TCACs) is necessary in that the areas served by all seven

Example of an APAC SIGWX Forecast
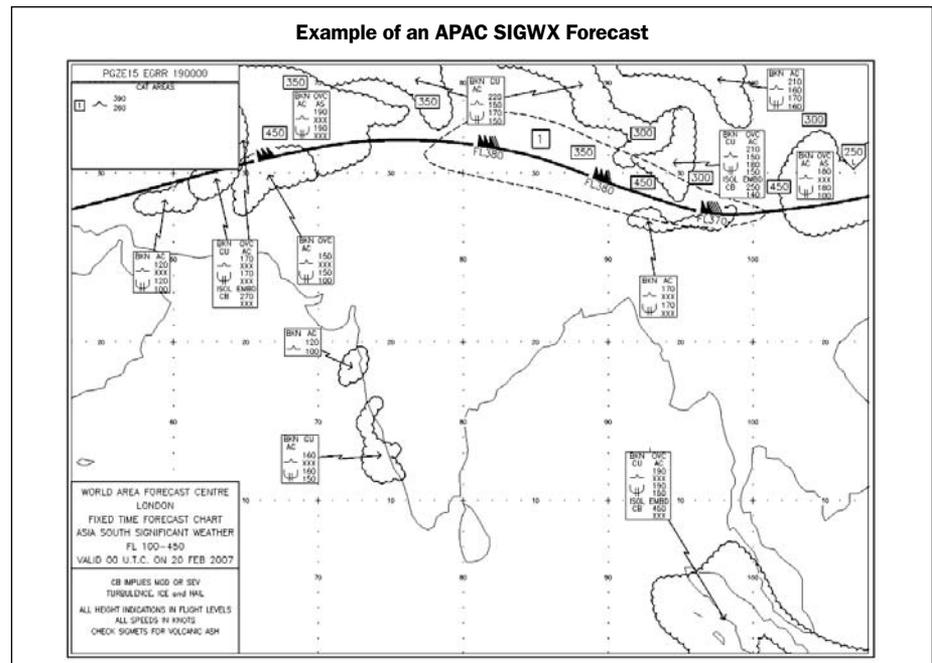
existing TCACs include some part of the APAC Region. Informing TCACs of changes associated with Amendment 75 to Annex 3 (e.g. the introduction of tropical cyclone advisories in graphical form) is conducted by ICAO through its involvement in various World Meteorological Organization (WMO) events related to tropical cyclones.

SIGMET

Necessary for flight safety, SIGMET provide information to users on hazardous meteorological phenomena.

A greater focus on the implementation of SIGMET has been conducted in recent years in the APAC Region. SIGMET are issued by MWOs designated by their State. Eight States are currently listed as having a deficiency in the issuance of SIGMET, the most in any deficiency category.

In the last two years, a bi-lateral agreement between China and Cambodia has allowed the Kunming MWO (transfer of duties to Chengdu MWO on 1 September 2010) to issue SIGMET for the Phnom Penh FIR since 1 June 2009—the first time SIGMET have been formally issued for a Flight Information Region (FIR) in a neighboring State in the APAC Region. The Regional Office was also recently informed of an agreement for the provision of SIGMET by Papua New Guinea on behalf of the Solomon Islands and Nauru. The Democratic People's Republic of Korea also established a MWO in February 2009 primarily for the issuance of SIGMET, while the Laos People's Democratic Republic is expected to establish its own MWO in 2010, which will issue SIGMET for the Vientiane FIR.

Myanmar has notified the APAC Regional Office that SIGMET is provided by the Yangon MWO for the Yangon FIR. Steps are

being taken for the possible removal of these deficiencies from the list of APANPIRG deficiencies through monitoring by Regional OPMET Data Banks (RODBs). Most recently, APANPIRG approved the removal of the SIGMET deficiency for Myanmar. Another sign of the improving participation in the issuance of SIGMET in the Region is the increased participation noted in the November 2009 SIGMET tests (volcanic ash, tropical cyclone and other meteorological phenomena). Specifically, eight new States participated in the SIGMET test for meteorological phenomena other than tropical cyclone and volcanic ash. Figure 1 *(bottom left)* shows the recent increase in test participation. This continued effort by States and the Regional Office is essential to maintain flight safety.

The METWARN/I TF will monitor developments associated with a global effort addressing the need to improve the issuance of SIGMET. That is, the APAC Region will participate in a feasibility analysis of SIGMET advisories issued by a designated regional advisory centre targeting States with SIGMET deficiencies. Monitoring of SIGMET globally for this trial analysis in 2011 is being conducted by Hong Kong, China. Analysis of SIGMET issuance with and without the trial SIGMET advisories will be reported to the Meteorological Warnings Study Group (METWSG) in 2012 for further action if necessary.

Another hazardous MET phenomenon, wind shear, occurs in the terminal area. To assist States in acquiring a suitable wind shear system based on the uniqueness of their environment, an APAC Wind Shear Systems Acquisition Workshop will be conducted in December 2010.

Issuance of TAF and OPMET exchanges

The International Air Transport Association (IATA) has produced OPMET (METAR and TAF) availability goals for the APAC Region. That is, IATA formalized requirements of 95 and 90 percent availability of OPMET data for AOP and non-AOP aerodromes respectively at the twentieth meeting of APANPIRG.

Aerodrome forecasts (TAF) in particular are used for flight planning and are necessary for selecting alternate aerodromes—which results in the optimization of fuel consumption. The increased availability of OPMET data as indicated in Figure 2 *(page 33, top)* reveals the commitment of the APAC Region to provide the necessary meteorological information.

Furthermore, IATA has determined a list of aerodromes that require TAF with a period of validity of 30 hours. These were considered as part of the Regional requirement used for planning ultra-long haul flights. Some aerodromes that require 30-hour TAF do not have ultra-long haul flights, but are used as alternates for them. State awareness of the importance of alternate aerodrome planning is reflected in the increase in implementation of 30-hour TAF, which doubled from 2009 to 2010 as indicated in Figure 3 *(page 33, bottom left)*.

Figure 1: APAC SIGMET Test Participation

Legend: State participation — MWO participation — Goal

Figure 2: Increasing Availability of APAC OPMET Data
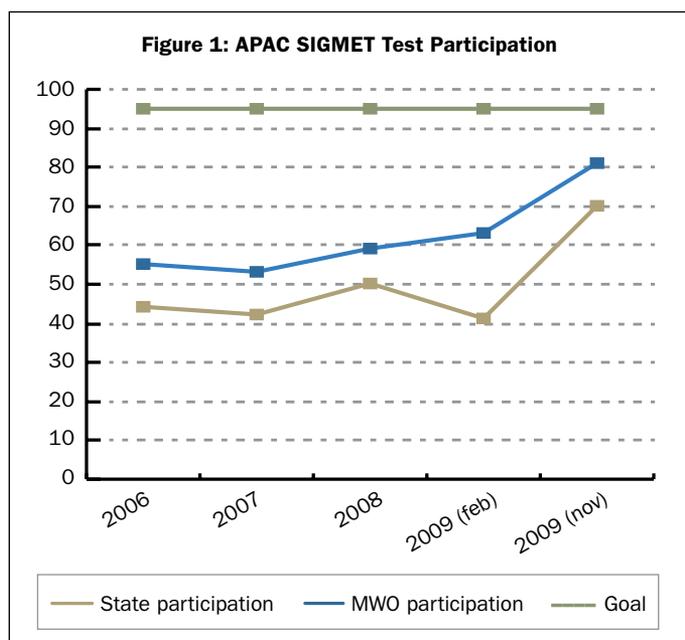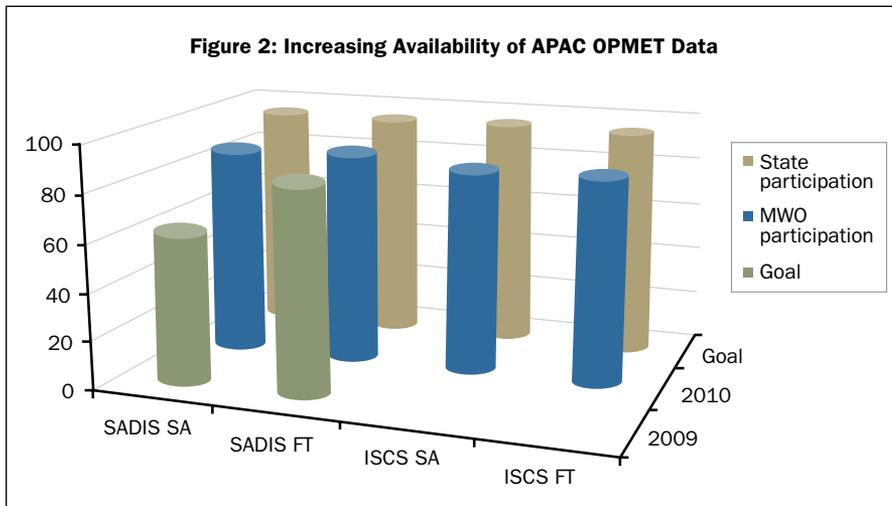
Technical Co-operation Activities

In order to mitigate MET deficiencies identified in the South Pacific Island States, ICAO, in coordination with the WMO, secured funds with the International Financial Facility for Aviation Safety (IFFAS) to resolve deficiencies in each of the eight signatory States.

The project, the Cooperative Agreement for the Enhancement of Meteorological Services for Aviation in the South Pacific (CAEMSA-SP), was carried out in late 2008 by an ICAO expert who developed action plans with the pertinent States to

Figure 3: Regional Implementation of 30-hour TAF at AOP Aerodromes

overcome deficiencies such as aging observing systems, poor communications, lack of WAFS forecasts and the need to issue SIGMET.

Due to the dilemma of low air traffic and the subsequent inadequate revenue available through cost recovery, many States will need further assistance from other States and international organi-zations to realize these goals. A second phase of the project will therefore commence in the second half of 2010 or sometime in 2011 to secure funding and determine associated tasks by donors to mitigate these MET deficiencies. This sub-Region's importance continues to increase with respect to its destination aerodromes and alternate aerodromes for Trans Pacific flights.
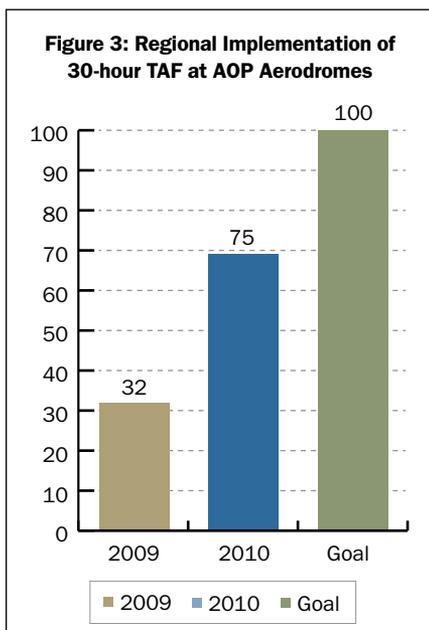
MET/ATM coordination

As the reliability of providing meteoro-logical information has improved in the APAC Region, some aerodromes have capacity concerns and are providing more services than those now proscribed for them in Annex 3.

To optimize capacity in busy terminal areas, coordination between MET and Air Traffic Management (ATM) stakeholders has become essential. Catered MET Services include specialized briefings, shared displays of weather to increase situational

awareness, convective forecasts to one or more hours, probability forecasts of CB, fog and other weather elements, and post event briefings to improve coordination for future weather impacts.

Determining requirements for these added services is in progress at the global level through ICAO and the WMO. In the meantime, specialized MET services for busy terminal areas continue to develop such as the Meteorological Services in the Terminal Area (MSTA) described in a separate article of this journal by Hong Kong, China. A planned MET/ATM Seminar will be conducted in Fukuoka, Japan in January 2011, where States will have the opportunity to exchange information on what MET Services are provided to ATM and how they are used to increase aerodrome and terminal area capacity.

Implementation of Future Standards

The implementation of Quality Management Systems (QMS) is a near-term concern since this will become a standard for all MET services and facilities according to Annex 3 beginning in November 2012. An APAC QMS Seminar was conducted by the WMO in cooperation with the Finnish Meteorological Institute in Tonga in July 2010, in order to facilitate State implementation of QMS.

Implementation issues related to the gradual application of net-centric meteorological data will arise in the mid- and late 2010s. This will include the possible use of Extended Mark-up Language (XML) in the exchange of MET data. It is necessary therefore to continue improving the provision of meteorological information in the near-term, before significant changes arise (XML and MET services for ATM) that will require a new focus on the implementation of demanding new requirements and new exchanges of meteorological information in the Region. ■

New Meteorological Services Supporting Air Traffic Management

The new Meteorological Services in the Terminal Area (MSTA) initiative, which is being undertaken by the WMO in close collaboration with ICAO, will provide meteorological services to support Air Traffic Management (ATM) for wider terminal areas, especially those at busy airports, which are currently not covered by the standard meteorological services stipulated by ICAO.

As C.M. Shun and Sandy M.K. Song of the Hong Kong Observatory, Hong Kong, China, report, ICAO and the WMO are continuing to coordinate further MSTA developments in advance of a projected 2014 endorsement for this promising enhancement to current MET/ATM capabilities.

C.M. Shun is Assistant Director of the Hong Kong Observatory. He was the MET Vice-chairman of ICAO's CNS/MET Sub-Group of APANPIRG from 2003 to 2009 and was elected President of the WMO's Commission for Aeronautical Meteorology in February 2010.

Sandy M.K. Song is Senior Scientific Officer of the Hong Kong Observatory. She is a member of ICAO's ASIA/PAC METATM Task Force and a core member of the Expert Team on MSTA and the Task Team on MSTA User Needs of WMO.

The international air navigation system is presently undergoing a paradigm shift: one that is moving it away from past Air Traffic Control (ATC) environments to the more integrated and collaborative Air Traffic Management (ATM) systems now needed to meet aviation's needs in the 21st century.

These requirements have stemmed from the more or less continuous growth in aviation and the ever present risk that the capacity of Regional air navigation systems may soon be exceeded by operator demand. This issue is presently of particular importance in the European (EUR) and in North American (NAT) Regions, but it has also become an increasingly urgent priority in the Asia/Pacific (APAC) Region, where the number of intra-APAC air travellers has recently surpassed associated domestic passenger totals from the North American market, making today's Asia-Pacific the world's largest aviation market.

The goal of the changes now under development is to ensure that ICAO's vision of a safe, secure, efficient and environmentally sustainable air transport system will continue to be available to all aviation stakeholders at the global, Regional and national levels. The implementation of a new ATM system that will make maximum use of the enhanced capabilities provided by advances in science and technology, as well as allowing for the effective sharing of available information on the basis of Collaborative Decision Making (CDM), is a mandatory component on the path to this objective. The Next Generation Air Transportation System (NextGen) and Single European Sky ATM Research (SESAR) initiatives are the corresponding programmes now ongoing in the USA and Europe to help effectively address this challenge.

It is under this evolving environment that the concept of Meteorological Services in the Terminal Area (MSTA)[1] was conceived of by the Commission for Aeronautical Meteorology (CAeM) of the World Meteorological Organization (WMO) in its 13th Session in 2006. In recent years, with increasing air traffic leading to issues of airport and route capacity limits, as well as the advancement of meteorological sciences such as numerical weather prediction and 'nowcasting' techniques, different meteorological products tailored for supporting Air Traffic Management (ATM) have been developed.

These developments have occurred in parallel across various Regions in order to address the gap between the data products stipulated in ICAO's existing standards and guidance and the newer and evolving 21st century ATM user needs for meteorological information. Currently, ICAO Annex 3 stipulates meteorological data products such as the Aerodrome Forecast (TAF), Trend-type Landing Forecast (TREND) and Aerodrome Warnings, which are presented to the users in highly-condensed codes in textual format.

The coded aspect of this weather data was a necessity in the mid-20th century, primarily to overcome the severe bandwidth

limitations in legacy telecom systems. It has since become a severe constraint for meteorologists as they seek to convey the specific details of available weather information to modern aircraft operators.

A case in point is how convective weather, which impacts busy approach areas, flight routes, corner posts and fixes over the wider terminal area[2], is already causing significant impacts to ATM operations and capacity. Currently this cannot be addressed by the regulated products which only provide generic weather information for the aerodrome—i.e. within approximately eight kilometres of its centre. Other products under development, in trial, or already in operational use at some airports in the APAC Region, include wind forecasts over approaches, crosswind probability forecasts for runways, strike probability for tropical cyclones, etc.

In more advanced applications of these weather products, specific information of the weather impact on air traffic capacity is also generated and provided to ATM and airline users. One such example is the Air Traffic Meteorology Center (ATMetC) of Japan.

To address these new and evolving ATM user needs and to avoid the costly parallel development of similar weather products of varying and confusing data formats, an expert team has been set up by the WMO in order to work closely with ICAO to develop a proper MSTA proposal. This proposal would be based on commonalities in similar products developed thus far and would also recognize current technical capabilities and limitations.

It is envisaged that this new MSTA data product would provide forecasts of weather elements critical to aviation in the wider terminal area, along with longer lead times and much finer resolution in space (both the horizontal and vertical domains) and time (especially in the first couple of hours of the forecast) compared to currently available aviation MET products. While MSTA is intended primarily for busier airports and terminal areas, it is also envisaged as a significant enhancement to aviation safety in general.

The new MSTA will be produced in a digital, gridded format, initially being available as a web-based colour graphic with alerting criteria. It will provide common situational awareness for data sharing by different user groups in support of CDM, and could be supplemented by textual descriptions as appropriate and simplified/condensed to facilitate uplinks to aircraft cockpits.

At this early stage in its development, the MSTA product will focus on forecasts

of convection, winds, low ceiling/visibility and winter weather. In addition, probability attributes of the various weather elements will be included as possible inputs for user decision-support systems. A number of core experts from various Regions are working together on MSTA development, including several from the APAC Region (Australia, Hong Kong/China and Japan).

Prototypes of convection *(see Figure 1, below)* and wind products have already been developed and were presented to the 14th Session of the CAeM held in Hong Kong, China in February 2010.

To facilitate further development of MSTA prototypes and input from the aviation community, a web site (http://www.msta.weather.gov.hk/) is currently being hosted by the Hong Kong Observatory with access available to WMO members and aviation users. In addition to the WMO expert team, a new Task Force on MSTA User Needs was also set up by the CAeM to strengthen engagement with aviation user communities, focusing on user needs and gathering feedback on the MSTA concept.

On the ICAO side, the Aerodrome Meteorological Observation and Forecast Study Group (AMOFSG) has established an ad hoc group to work closely with the WMO Task Force to coordinate inputs from the requirements perspective. Its work programme also includes consultations with the ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP).

The objective of these efforts is to develop a detailed MSTA proposal, supported by ICAO and the aviation user communities, ready for endorsement by the next Conjoint ICAO MET/AIM Divisional Meeting/WMO CAeM Session (currently scheduled for 2014) and reflected in ICAO Annex 3. ■

Figure 1: A prototype MSTA convection product presented in an integrated display.

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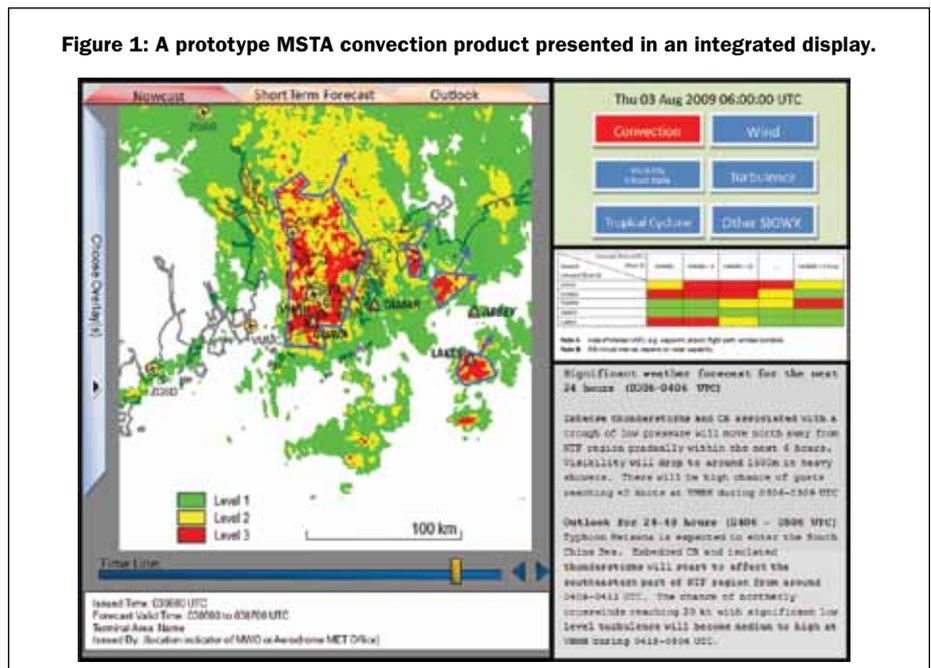
[1] The term 'New Terminal Forecast (NTF)' was initially used when the MSTA concept was first developed. It was subsequently renamed as Meteorological Services in the Terminal Area (MSTA). This was done to avoid possible misinterpretation that the new services were intended to replace the conventional 'Aerodrome Forecast (TAF)'.

[2] The terminal area is the portion of the airspace within the proximity of a controlled aerodrome, within which arriving and departing aircraft are managed to provide separation, assurance, appropriate arrival spacing, appropriate departure spacing and final approach sequencing.

UPCOMING ICAO APAC EVENTS*

Meetings	Site	Duration
ARAST & Flight safety	TBA	21–24 February
SEA ADS-B WG/6	Singapore	24–25 February
National Inspectors Course	Auckland, New Zealand	23 February – 3 March
BBACG/22	Bangkok, Thailand	7–10 March
Aviation Cargo and Mail Security Course	Kunming, China	7–11 March
SOCM/2 Meeting	Bangkok, Thailand	14–16 March
AAITF/6	Bangkok, Thailand	15–18 March
COSCAP MRB Seminar	Bangkok, Thailand	23–25 March
OPMET/M TF/9	Bangkok, Thailand	21–23 March
FPL&AM/TF/4 & Seminar	TBA	21–25 March
METWARN/I TF/1	Bangkok, Thailand	23–25 March
COSCAP MRB Seminar	Bangkok, Thailand	23–25 March
Dangerous Goods Course	Bangkok, Thailand	28 March – 8 April
ADS-B Seminar and ADS-B SI TF/10	TBA	25–29 April
Seamless ATM Workshop + Ad Hoc Group	Tokyo, Japan	11–13 April
PBN TF	Delhi, India	18–22 April
Environment Workshop	Bangkok, Thailand	TBA
SEACG/18 & FIT-SEA/11	Bangkok, Thailand	9–12 May
SMS Implementation Seminar	Bangkok, Thailand	16–20 May
ATNICG/6	Seoul, Republic of Korea	23–27 May
AVSEC Instructors Course	Hong Kong, China	24 May – 1 June
CMRI	Bangkok, Thailand	TBA
Aviation Cargo and Mail Security Course	Kuala Lumpur, Malaysia	6–10 June
11th SCM of COSCANA	Mongolia	21–23 June
ATM/AIS/SAR/SG/21	Bangkok, Thailand	27 June – 1 July
CNS/MET SG/15	Bangkok, Thailand	25–29 July
BOB/RHS/TF/6	Bangkok, Thailand	TBA
RASMAG/15	Bangkok, Thailand	1–5 August
AVSEC Crisis Course	Auckland, New Zealand	15–19 August
AVSEC Crisis Course	Kunming, China	22–26 August
APANPIRG/22	Bangkok, Thailand	5–9 September
National Civil Aviation Security Training Programme Workshop	Hong Kong, China	6–14 September
SEA-RR/TF/5	Bangkok, Thailand	TBA
ATNICG WG/10	TBA	TBA
48th DGCA Conference	New Caledonia	9–14 October
Crisis Management Workshop	Kuala Lumpur, Malaysia	31 October – 4 November
3rd SCM of FPP	TBA	7–8 December
RASMAG/16	Bangkok, Thailand	TBA

* This is a partial list and many dates are subject to change. Please consult the ICAO APAC Web site for more up-to-date details on specific meetings and dates.

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