Air Transport

■ Sustainable Airport Development ■ A Partnership for Safety ■ Open Skies and Indonesian Airlines ■ Infrastructure for Aviation ■ The Importance of Data ■ The Impact of Growing Demand ■ Preparing for Open Skies

CONTENTS

Australian AID

Editor's Message

While working on this edition of **Prakarsa**, I couldn't shake the feeling that aviation infrastructure is quite different from the other sectors that the Indonesia Infrastructure Initiative addresses. But the content of this issue offers only partial support for that contention.

Our feature articles send three clear messages about Indonesia's air transport sector. First, demand for air transport is growing, while resources remain constrained. Indonesia's continuing economic development means that more people want to fly. The implementation of the ASEAN Open Skies Agreement in 2015 will further increase demand. But airport capacity is already strained, and the skies are not getting any larger. More aircraft will have to occupy the same physical space. The problem of growing demand and limited resources is familiar across all types of infrastructure development, so in this regard aviation is no different from other sectors.

Second, the future of Indonesia's civil aviation is deeply intertwined with regional and ultimately global considerations. The liberalisation of the ASEAN market under Open Skies makes this particularly true, since Indonesian airlines will face both stiffer competition and enhanced opportunities. But even without Open Skies, aviation is inherently an international subject, because safety and operational standards must be harmonised among countries to ensure the safe flow of traffic. This characteristic does set aviation apart from most types of infrastructure, such as sanitation or urban mobility, that are primarily domestic concerns. With the exception of ports, no other sector is so firmly tied to developments beyond Indonesia's borders.

Third, safe and efficient aviation is strikingly dependent on the proper use of new technology and the management of high quality data. Remarkable progress has been made in the capability to monitor the precise position of aircraft, and to share up-to-date information among aircraft and air traffic managers. Older technology is much more limited and is increasingly inadequate as air traffic grows. In this way, aviation does stand apart. No other sector is so reliant on cutting-edge technology to ensure safety.

There is another way in which aviation may appear to be different from IndII's other work. When low income families obtain access to water, or rural roads are made safer for travel, the benefit to poor citizens is obvious. In contrast, one might think improved aviation will help only wealthy people who can afford to fly off on vacations and shopping sprees.

This is simply not true. Air transport offers the only means of access to some remote and underdeveloped areas that stand to benefit greatly from connections to the outside world. Further, the introduction of low-cost carriers is making air travel more affordable for citizens with modest budgets.

Finally and most importantly, Indonesia's archipelagic topography means that air transport is especially vital to support economic growth. In short, Indonesia's future prosperity depends on a safe and reliable aviation sector. The resulting benefits will reach all of Indonesia's citizens – even those who never set foot on an aeroplane. • CSW

Infrastructure by the Numbers

99%
The percentage of visitors to Indonesia who transit through Ngurah Rai airport in Bali.

24
The number of new airports that the Government of Indonesia plans to build in 2012.

23
The rank of Jakarta's Soekarno-Hatta Airport in size, among all airports in the world.

24%
Indonesia's share of the ASEAN aircraft fleet.

21%
Indonesia's share of aircraft seat capacity in ASEAN. That seat capacity is less than Indonesia's share of aircraft reflects the fact that Indonesian airlines use smaller aircraft than those operating in Thailand, Singapore, and Malaysia.

62 million/year
The number of passengers that Soekarno-Hatta Airport will be designed to accommodate following planned expansions between now and 2014. Its current capacity is 22 million, although it serves about 44 million annually. By 2025, demand is estimated to grow to 87 million passengers annually.

GROWING TRAFFIC, GROWING NEEDS

Indonesia's demand for air travel will grow along with its economic development, and Open Skies will make this demand grow even faster. But is aviation infrastructure ready? • By Michael Fairbanks

The terminals at Soekarno-Hatta Airport in Jakarta are already operating at levels in excess of their capacity.
*Photo by Rahmad Gunawan*

How much do the citizens of Indonesia want to fly? The correct response to that question might seem to be a simple number – how many aeroplane flights do they take in a year? – but there is a far better method for providing a meaningful answer. "Propensity to fly" looks not only at how many flights per person the citizens of a country take, but also considers a country's wealth, allowing better comparisons to other nations and more accurate projections of future demand.

The number of flights taken per capita is understandably influenced by how well off a country's citizens are. This is demonstrated in Figure 1, which shows the relationship between annual air trips per person and economic activity, quantified as gross GDP per capita. Figure 1 illustrates the position of Indonesia relative to other ASEAN countries and other neighbouring countries, as well as some other countries with significant air transport demand, such as the United States and the United Kingdom. The bubble size is indicative of the population of each country and the centre of the bubble shows the number of air trips per person as a function of each country's per capita GDP. The dotted line uses a statistical tool to calculate where we would expect the centres of all bubbles to appear on the graph, if every country had the same relationship between GDP and demand for air transport. Countries above the line have a higher propensity to fly, while those below it have lower.

The figure shows us that Indonesia is already ahead of the curve in its demand for air travel – not surprising given Indonesia's island geography and long distances between major cities. (Of the other ASEAN countries for which there is reliable data, Malaysia, Thailand, Philippines and Cambodia also show a higher than expected propensity to fly; Vietnam and Brunei show a slightly lower than expected propensity to fly; and Singapore is approximately as expected.)

Figure 1: Propensity to Fly as a Function of GDP Per Capita

$y = 4E\text{-}06x^{1.313}$
$R^2 = 0.903$
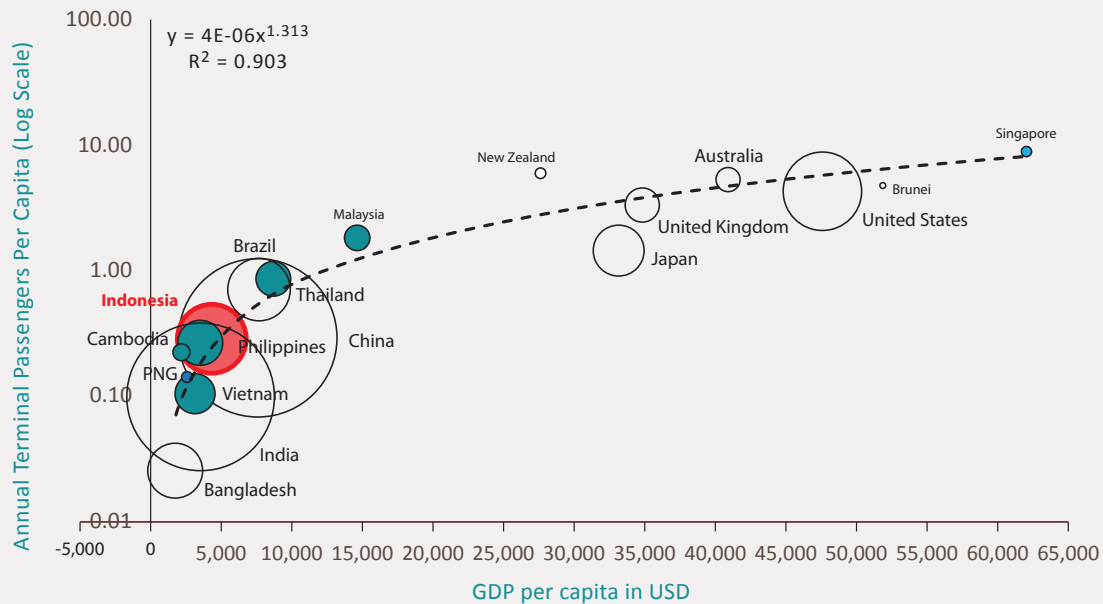
Sources: World Bank, Air Transport Intelligence, CIA Factbook and Helios analysis
Note: Bubble size is proportional to population. ASEAN countries other than Indonesia are shown in blue.

The same data that underlie Figure 1 suggest that, thanks to Indonesia's rapid economic growth and large population, unconstrained demand for air transport (domestic and international) might be expected to grow at an underlying rate of between 6 and 10 percent per year. This is in the absence of any stimulus effects such as the ASEAN Open Skies Agreement.

Key Points

Indonesia's demand for air transport is higher than would be expected from looking at its GDP per capita. This is not surprising given Indonesia's island geography and long distances between major cities. As Indonesia continues to develop, baseline growth in demand can be expected to grow by as much as 6 to 10 percent annually. Past experience with Open Skies agreements suggests that the introduction of ASEAN Open Skies could add another 6 to 10 percent growth in demand. Therefore, in the period immediately following Open Skies, growth in unconstrained demand for international air travel in Indonesia might, optimistically, be as high as 20 percent per annum, but it is very likely to be greater than 10 percent. Air transport is both a cause and effect of economic growth, creating a "virtuous circle" of economic growth followed by increased demand that creates more growth and so on. This is particularly relevant in Indonesia, where the petroleum and extraction industries (both of which are highly reliant on air transport compared to many other industries) are significant contributors to economic growth. However, projections of increased demand for air transport assume that sufficient infrastructure capacity will be available. But Jakarta's Soekarno-Hatta Airport is already capacity constrained and will remain so for the foreseeable future, even with planned developments. Indonesia's other airports and air traffic control infrastructure will also need upgrading to meet projected demand, and institutional and regulatory systems will need to develop alongside infrastructure.

The Stimulus Effects of Open Skies

Experience suggests that after an Open Skies Agreement is implemented, demand will grow at above-baseline rates for about five years. (This assertion is based on the impact of the Open Skies agreements concluded between various European countries and the United States in the mid-1990s.) Traffic growth then reverts to the baseline level. This is illustrated in Figure 2.

It must be remembered however, that this enhanced growth is principally focused on the routes liberalised though Open Skies, although there may be some associated stimulation of other routes. In Indonesia's case, therefore, in the absence of capacity constraints, the growth in international traffic due to Open Skies might be expected to increase an additional 6 to 10 percent per annum above the normal baseline growth rates during the period immediately after Open Skies is implemented. Therefore, for the period immediately following Open Skies, growth in unconstrained demand for international air travel in Indonesia might, optimistically, be as high as 20 percent per annum, but is very likely to be greater than 10 percent per annum.

Figure 2: Illustration of Impact of Open Skies on Demand for Air Travel
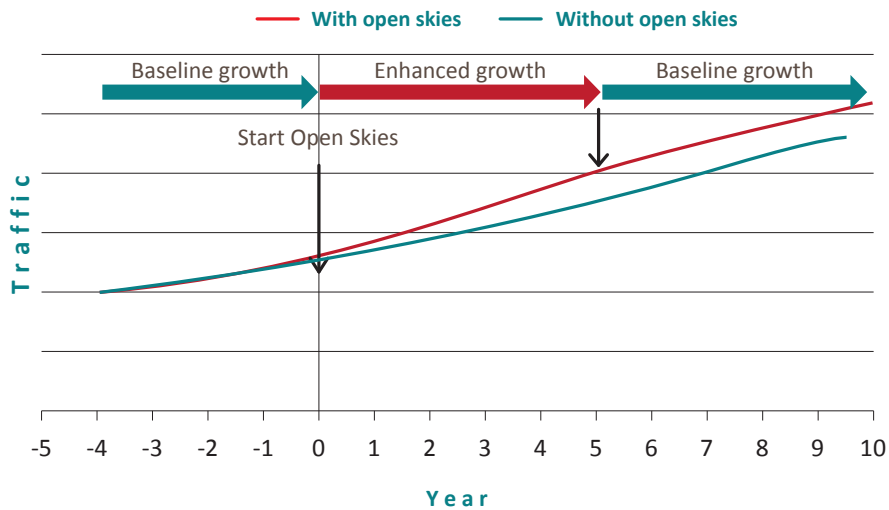
The Air Transport Virtuous Circle

As well as being a consequence of economic growth, air transport services can also be an important driver of growth. These services produce wider impacts than simply the effects on airlines and airport operators (see Figure 3). This is known as the "virtuous circle" of air travel:

- An air passenger not only pays for his ticket but also spends on hotels, taxis etc. and contributes to the development of commerce.

- An airline carrying more passengers spends more on catering and other support services.

- The growth in these industries/support services thus leads to increased necessity for travel.

In addition to the employment-related benefits, there are a number of other macro- and micro-economic and social benefits associated with air services. These benefits include:

- Improved business efficiency through the availability of more convenient (timely, frequent, faster) connections between Indonesia and key trading areas, which in turn makes the country a more attractive location for foreign direct investment

- Reduced whole-trip costs (whole-trip costs consider not only ticket price but also how long the journey takes, as well as associated costs such as forced overnight stays)

- Inbound tourism benefits, including longer stays, increased spending and larger numbers of tourists

- Greater ease of returning home to visit family and friends (an important benefit in the case of migrant workers and more permanent diaspora)

Figure 3: The Air Transport Virtuous Circle
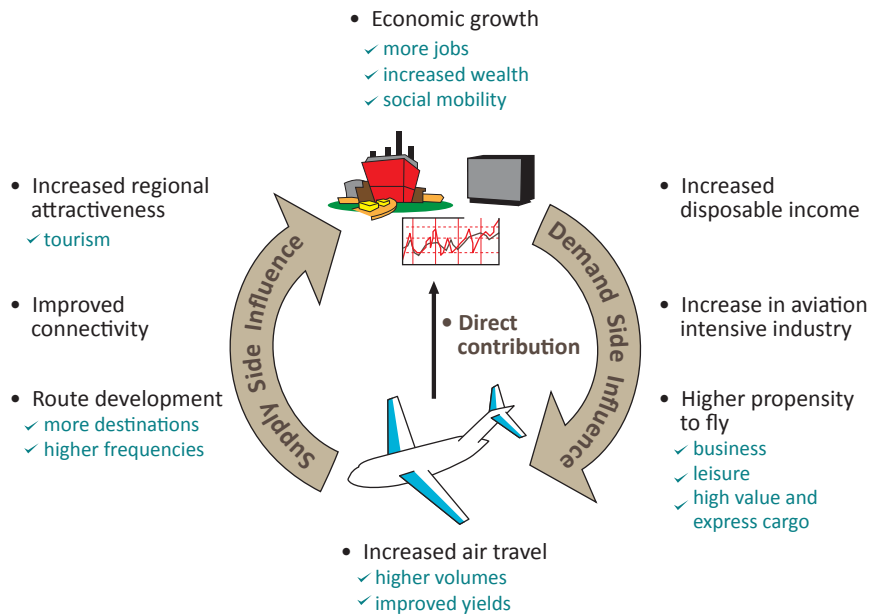
Figure 4: The Most Aviation-Intensive Sectors

Top Ten Aviation Industry Sectors

Aviation Intensity
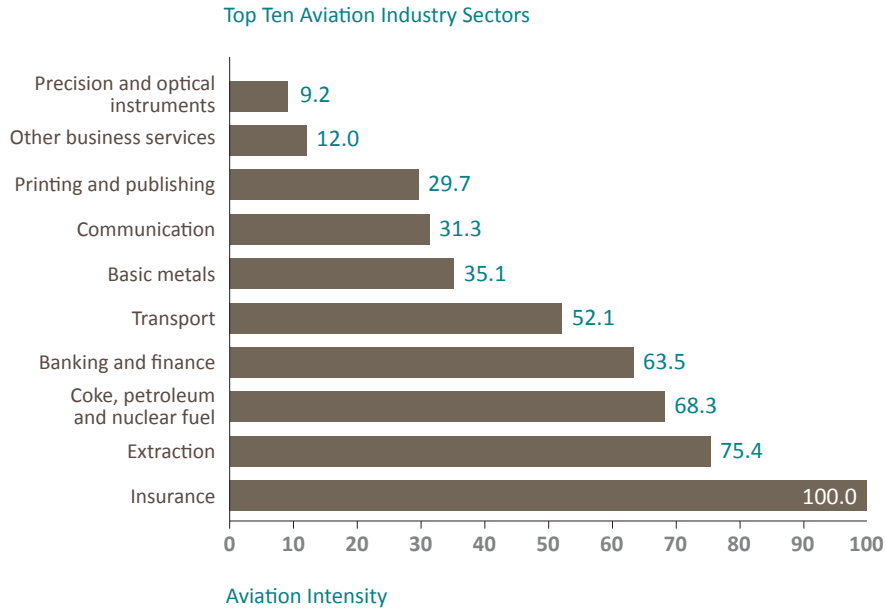
Air transport is also essential to support many specific industries. Figure 4 gives an indication of the contribution air transport makes to different industry sectors by using an aviation intensity index: the higher the index, the more that industry relies on air transport. The data suggest that air transport is particularly important for the well-being of Indonesia's economy because of the country's relatively high levels of activity in petroleum, gas and mineral extraction, which rank high among industries that rely on air transport. (Note: This illustration does not include tourism, since when people travel as tourists it is a leisure rather than a business activity. Clearly tourism is a major driver of air transport, and should be considered in addition to the industries listed.)

Figure 5: Comparison of Demand and Capacity at Soekarno-Hatta Airport
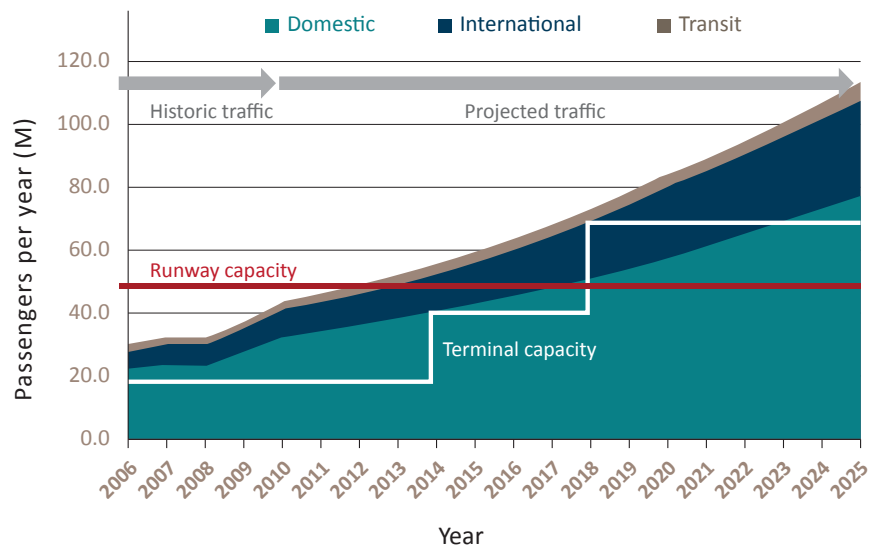
Source: Derived from Oxford Economic Forecasting - *The Contribution of the Aviation Industry to the UK Economy*

The Capacity of the Current Infrastructure

The figures used above to project growth in demand for air travel in Indonesia assume that the situation is unconstrained – in other words, they assume that the available infrastructure provides enough capacity to support this growth. At present, however, this is probably far from the case. The situation at Jakarta's Soekarno-Hatta Airport offers an illustration. Figure 5 compares the passenger capacity at Soekarno-Hatta with the unconstrained demand (sub-divided into international, domestic and transit traffic) that might be expected in the future. Two levels of capacity are illustrated[1]: the first is the capacity of the current and planned terminal facilities, shown as the white line. The second is a theoretical passenger capacity derived from operations on the airport's two existing runways.

The figure is striking in two main respects:

- Soekarno-Hatta is currently operating at roughly twice its terminal capacity.

- Despite planned enhancements, the airport is likely to lag significantly behind demand into the future, even though conservative traffic projections have been used.

In addition to Soekarno-Hatta Airport, which will need the most significant development to cope with traffic growth, studies[2] have highlighted the capacity crunch that is likely to occur in the near future at other Indonesian airports – notably Juanda Airport in Surabaya, Ngurah Rai Airport on the island of Bali and Sultan Hasanuddin Airport in Makassar. In addition to the airports, improved air traffic control facilities, including communications, navigation and surveillance and Air Traffic Management, supported by the appropriate processes and procedures, will be needed to ensure that airspace does not become a bottleneck.

Challenges Ahead

Clearly air transport is critical to the economic development and social welfare of Indonesia irrespective of the implementation of ASEAN Open Skies. Indonesia's air transport infrastructure – both airports and Air Traffic Management – needs upgrading to provide sufficient capacity so as not to inhibit growth in demand for air transport, whether that is the baseline growth fuelled by (and enhancing) Indonesia's rapid economic development or the additional benefits that can be delivered by Open Skies.

Not just new infrastructure, systems and technology will be needed. Also required will be supporting policies and regulations related to safety, security, environmental protection and market access. The challenges that lie ahead are significant, but are by no means insurmountable. ∎

NOTES

1. Capacities have been derived from the *Master Plan Study on Multiple-Airport Development for the Greater Jakarta Metropolitan Area in the Republic of Indonesia.* Nippon Koei Co Ltd, Oriental Consultants Ltd, Gyros Corporation. March 2011.

2. Indonesia Infrastructure Initiative (IndII), Activity 220. *National Strategy for the Implementation of ASEAN Open Sky Policy Stage 2, Final Report: Implementation and Technical Report*. Mott MacDonald Ltd. June 2011.

About the author:

Dr Michael Fairbanks has been a management consultant for over twenty years. He specialises in the policy, institutional, regulatory, business and operational performance aspects of air and marine transport infrastructure.

Mike has completed projects in a range of countries around the world, including Australia, Austria, Abu Dhabi, Indonesia, Lebanon, the Netherlands, Norway, Poland, Saudi Arabia, Singapore, Switzerland and the US, as well as his home country, the UK. He has also worked for a range of international clients, including the European Commission, Eurocontrol, Inmarsat and the World Bank.

Recently, in addition to supporting IndII on its ASEAN Open Skies project, he has assisted the UK Minister of Transport's South East Airports Taskforce to address performance issues at the London airports; worked on the regulatory assessment of Changi Airport for the Civil Aviation Authority of Singapore; and assisted Heathrow Airport in a wide range of activities including scheduling and slot allocation, preparation for the London 2012 Olympics, operational performance improvement, and aircraft noise and emissions management.

Mike joined the UK-based business and technology consultancy Helios in 2006 from Booz & Company, and is currently the director in charge of Helios' airports practice. Mike holds BA and DPhil degrees in Physics from Oxford University and is a Fellow of the Royal Institute of Navigation.

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Why Data Matters

The advent of a Global Positioning System is revolutionising aircraft navigation. Safety, environmental, and economic benefits will result from adopting technology that uses the high quality data now available. • By John McCarthy

Where does that runway end? In the past, mapping errors gave answers that were wrong by as much as 200 metres.
Courtesy of Tim Forbes

Not so long ago aircraft navigated by tracking from one ground-based (terrestrial) navigation aid (navaid) to the next. The exact location of the navaid was not really important because the aircraft track was determined by the radio frequency signals it received from the navaids. To land, the aircraft homed in on a navaid near the desired runway end – and near enough was usually good enough. Alternatively, a radar operator gave instructions to the pilot, guiding the aircraft to a position where horizontal and vertical navigation was possible, using a precisely directed beam of a runway aligned Instrument Landing System (sometimes called a Precision Approach system). The beam was not received by the aircraft until it was aligned with the centre of the runway.

Key Points

Improvements in navigation methods and aircraft track keeping ability offer potential improvements in aviation safety and economic efficiency as well as decreased environmental impacts. Access to these benefits can be inhibited by a lack of high quality aeronautical data. Because the capture and processing of aeronautical data is a complex process, considerable uncertainty can exist in the actual data that is used for detailed navigation.

So an increased awareness of the processes, uses and available products in the aeronautical data chain is necessary to ensure that the benefits of high quality aeronautical data are obtained.

However, with the advent of the Global Positioning System (GPS), and its use as a Global Navigation Satellite System (GNSS), things have changed dramatically. Determining the accurate position of the aircraft in real time – to within a few tens of metres – suddenly became possible. All modern aircraft can utilise satellite navigation for tracking between pre-defined positions. This is becoming the main means of navigation for many aircraft. Some of the very latest aircraft models don't even have sensors for some of the less accurate navigation aids.

Even when a track is defined between terrestrial navigation aids, the aircraft's flight management computer may combine the positions of the navaids defined in its database with satellite navigation signals to keep the aircraft on track – because the position derived from satellite navigation is more accurate and reliable. In fact, the navaids don't even need to be operating for aircraft that can use satellite navigation – all that these aircraft need is the navaid's position on the earth's surface and enough signals from the satellites.

So, in this new world of computerised satellite navigation, and modern flight management systems in the aircraft, the data used for navigation is vital. It enables more accurate and flexible navigation. It is more accurate because the signals used for satellite navigation are more accurate and consistent than those of the older terrestrial navaids. It is more flexible because the waypoints between which the aircraft can be tracked can be located almost anywhere.

At the same time as satellite navigation has been developing, the track keeping ability of the latest aircraft models has improved dramatically ("track keeping" refers to the ability of the aircraft to stay precisely in position along the track that has been calculated between two points). Some aircraft can maintain a track keeping precision of less than a few hundred metres even in high crosswinds. This can provide substantial safety benefits for the passengers and significant cost savings for the airlines – as well as lessening the environmental impact of the flight through reduced fuel consumption and minimised noise pollution.

The crucial foundation upon which these improvements must be built is data. It has to be reliable (there can be no data errors), accurate (sufficiently accurate for the intended purpose) and complete (it is useless if it covers only part of an air route or includes some types of data but not others). It's not that the use of aeronautical data is new – it's that now it is indispensable and must be of high quality.

Generally the data is flight-tested prior to publication and operational use. There have been some well documented examples of what happens when data has been found to be wrong during flight testing. For example, an aircraft is landing during a flight test and the runway end is not where the aircraft's aeronautical database thought it would be – it's been known to be up to 200 metres away from the location given in the database because of a mapping error. Or a new phone tower has been erected near a runway end, and this was not considered during the design of an approach – so the safety margin above the tower is inadequate. Fortunately, such tests are always carried out in good visibility so that these sorts of errors can be found prior to operational use in poor visibility.

The use of data is fairly complex. It can be derived from calculations or it can come from surveyors' reports. It is passed about and shared by government agencies, used in charting and developing aeronautical databases and then ultimately used by airlines in safety-critical landings or take offs in all sorts of weather. So it is vital that it is handled in the correct way and that information about its accuracy, integrity, source, intended use, etc is available to all potential users.

The processes related to collecting and using aeronautical data are relatively new and aviation professionals and their organisations are only just starting to come to terms with the complexity and benefits of managing it. Countries are at widely varying levels in terms of their adoption of GNSS, with Australia, the United States, and Canada at the forefront and Europe now beginning to use it. Indonesia is starting to implement programs that will allow it to take advantage of some of the benefits of GNSS. Recently some advanced satellite navigation approaches, designed by an American company, have been implemented by Lion Air. Australian experts are assisting their Indonesian counterparts by providing expertise and experience in some of the enabling technologies such as managing aeronautical data and providing training for satellite based navigation.

As more and more countries adopt GNSS and the amount of air traffic increases, it will become more and more important to capture, distribute, and understand aeronautical data. Near enough is no longer good enough! ■

About the author:
John McCarthy is a Director of the Australian company Strategic Airspace, which specialises in the application of air navigation technologies (particularly Global Navigation Satellite Systems) to aviation safety and develops software for aviation authorities to design safe aviation procedures. John has degrees in Pure Mathematics, Computing and Architecture, and has worked as a high school teacher, university research officer, university lecturer, software developer and consultant. About 25 years ago he started developing software for the Department of Civil Aviation for various aspects of aviation navigation and safety. In that time he has become a subject matter expert in aviation navigation and safety and works as a consultant in the area with a number of aviation authorities and airlines around the world, as well as continuing to develop software for these applications.

AVIATION INFRASTRUCTURE: A LOOK TO THE FUTURE

Indonesia's airspace is being filled with more and more flights. At the same time, the infrastructure for aviation management is becoming increasingly complex. Taking advantage of these advancements in technology will require strategic planning – but it will pay off in enhanced safety, greater efficiency, and economic growth. • By Mike Gahan

The skies of Indonesia may seem limitless, but they are not.
Courtesy of Eleonora Bergita

Modern aviation transport systems are an integral part of a nation's multi-modal transport sector. Aviation is a fast developing and dynamic industry at the forefront of technology, and it is essential to national development. No matter what level of development a country has reached, aviation infrastructure is critical:

- Fully developed nations require it to enable movement of passengers and goods in order to continue high levels of economic activity.

- Partly developed nations require it to expand their economies and improve economic conditions.

- Less developed nations require it in order to access remote areas for assessment of development needs and to supply much needed aid. In some cases, the only access to remote areas is by air.

Indonesia exhibits aspects of all three levels. It has an expanding middle class with disposable income who travel for business and for tourism. It has regions of growing economic activity that are reached most efficiently by air. And in some remote parts of Indonesia, the only means of transport is by air.

As demand for air transport continues to grow, the number of aircraft using Indonesian airspace is expected to increase threefold in the next 15–20 years. If current and future levels of activity are to be safe and sustainable, Indonesia's air transport industry must be supported by strong and well planned multi-modal and safe infrastructure.

Airspace is a vital part of the support infrastructure for aviation activity. There is a limited amount of airspace available and no way to create more. Thus, the use of airspace must be planned and managed carefully in order to maintain high levels of safety at the same time as usage is increasing. While the civil passenger and the air freight industries are the major users of airspace and the supporting infrastructure, they are certainly not the only users (airspace is used for non-commercial and military purposes as well). This adds to the complexity of long-range planning and safety assurance.

Technology

Among the technological dimensions of airspace planning are surveillance, navigation, communication, Air Traffic Management, and information management.

Surveillance: In 1903, the only form of surveillance available to those who watched the Wright Brothers' first flight at Kittyhawk was visual inspection. Times have changed, and now air navigation service providers and airports employ a wide range of technologies for surface and airspace surveillance.

Key Points

At all levels of economic development, modern aviation transport systems are an integral part of a nation's multi-modal transport sector. Indonesia needs aviation for business, tourism, and access to remote areas. The number of aircraft using Indonesian airspace is expected to increase threefold in the next 15–20 years, which makes strategic planning for safe and modern infrastructure essential.

The technological dimensions of airspace planning include surveillance, navigation, communication, Air Traffic Management (ATM), and information management. The modern surveillance technologies that are being widely adopted throughout the world are Automatic Dependent Surveillance/Broadcast (ADS/B) and multilateration. Indonesia has already installed a number of ADS/B receivers, but the equipment is costly. Multilateration provides a "path to the future" as it can be used as part of the transition to ADS/B, and it is significantly cheaper than conventional radar.

Current navigation technology is based on satellites, which allows safer and more efficient use of airspace. For communication, analogue voice communication is still the mainstay, but digital data link communications are being more widely introduced.

Air traffic "management" has replaced air traffic "control", and is a much more strategic approach that makes better use of air space, reduces emissions and delays, and improves safety.

Reliable and robust information management must underpin each of these technologies. In Indonesia and elsewhere, the introduction of the technologies must be strategically planned to ensure the best mix of technologies is available at each time and place. The decision about what to do when a piece of equipment needs replacement is far more complex than in the past, as the way in which all elements of the system (technology, avionics, training, data, people, airspace design, experience, regulation and policy) will interact must be taken into account.

As the technologies available to support aviation continue to evolve, the aviation industry will be increasingly challenged to make the best use of those technologies to ensure safe operation of the aircraft and airspace.

Traditionally, this surveillance was radar. Today the systems used in the US, Europe and Asia are moving towards the utilisation of more advanced capabilities and functionality provided by two technologies: Automatic Dependent Surveillance/Broadcast (ADS/B) and multilateration.

ADS/B transmits data on an aircraft's position and speed second-by-second to flight controllers and other aircraft, ensuring that pilots and controllers are operating based on the same information. If desired, the data can be recorded and used for post-flight analysis and to improve flight tracking and planning.

ADS/B is the surveillance technology of the future, but it requires the installation of additional equipment on aircraft – equipment which is fairly expensive. Indonesia has installed a number of ADS/B receivers which are capable not only of providing data to Indonesia's airspace management systems (Angkasa Pura I and Angkasa Pura II) but which can also can be shared with the Australian airspace management agency. Data from ADS/B receivers in northern Australia is provided to Indonesian airspace managers.

A technology known as multilateration has emerged as a highly accurate surveillance system with both surface and airspace surveillance capabilities. (This technique involves determining an aircraft's position by measuring the different arrival times of synchronised signals from the aircraft by at least three different receivers.) Multilateration provides a "path to the future" as it can be used as part of the transition to ADS/B. Because it has a distributed architecture (meaning that multiple receivers are used to work together to produce results), multilateration can be used to overcome coverage deficiencies experienced by single point conventional radars. It is also significantly cheaper than conventional radar, both in initial purchase price and expected long-term maintenance costs; this makes it an ideal choice in situations where surveillance needs to support safe operations that may expand rapidly, as can be the case in remote areas and in the dynamic mining/extractive industries.

Research is also well advanced on technologies that will detect foreign objects, humans, and animals that are on or near runways.

Navigation: Navigation in the early days of aviation was "point-to-point" using ground-based beacons. These beacons marked air routes (highways in the sky) as well as providing a means of guiding aircraft to the runway for landing. Placing these facilities in remote areas was difficult and costly. Ongoing maintenance and testing made up a large part of the annual budget for service providers.

These days, navigation is increasingly based on the use of satellites. This has allowed design of much more efficient air routes, without the need to site and support ground-based infrastructure. As a result, safety is enhanced for operations in remote areas and much more efficient and safe use can be made of the available airspace.

The use of navigation systems that do not rely on ground-based beacons has placed greater emphasis on data management and on ensuring the data used is accurate, current and disseminated in a timely

manner and in standard formats. (See "Why Data Matters" on page 10 of this issue for more information about this topic.)

Communication: Analogue voice communication on high and very high frequency systems has been the cornerstone of aviation communications infrastructure for over 50 years. This means of communication is still the mainstay; however, digital data link communications are being more and more widely introduced. These data links directly transfer information between aircraft and controllers, allowing much more data to be passed and improving the safety and efficiency of the overall system.

Air Traffic Management: The term "Air Traffic Management" (ATM) has replaced "Air Traffic Control" (ATC) to describe the activities undertaken to provide separation and information services to aircraft.

"Control" was a tactical activity, which involved issuing instructions to aircraft to maintain fixed tracks and fly at altitudes that were often not fuel efficient. The short term nature of the control also often involved holding aircraft in racetrack patterns as they circled the sky in the vicinity of airports.

"Management" of air traffic is a much more strategic approach, taking into account the airlines' desires to fly fuel-efficient trajectories, and making the best use of available airspace and supporting infrastructure to improve overall system efficiency and reduce emissions and delays.

The ATM systems in use today and which are being improved for use in the future are much more capable than the ATC systems of the past. This increased capability means they are much more complex and require more operator training and supporting infrastructure. It also means that much more air traffic can be allowed to use the available airspace with greater levels of safety and efficiency.

Information Management: All modern systems, including ATM, rely for their integrity and safety upon the management of information and data. This means the infrastructure for the collection, collation, distribution and control of the information needs to be reliable and robust. Whilst this does not always mean physical infrastructure, it is a real and necessary part of the overall system of transport upon which modern systems rely.

Planning

In Indonesia and indeed everywhere, the introduction of these new technologies as part of the aviation infrastructure must be strategically planned to ensure the best mix of technologies is made available at the most appropriate time and in the most appropriate places.

In the past, as a navigation aid or radar installation approached the point where a replacement was needed, the decision about what to do was a simple one: replace it with the latest model of the same technology. The advent of the new technologies described above means that the decision is now much more complex, and requires planning that considers how the various elements of the entire system (such as technology, avionics, training, data, people, airspace design, experience, regulation and policy) interact. It is also necessary for the planning to take into account the infrastructure available in aircraft and the systems and infrastructure in use in neighbouring countries.

To ensure that the Indonesian aviation system can manage the number of aircraft expected to fly among domestic airports, bring tourists and business people to assist in economic development, and overfly between neighbouring countries, it has been necessary to undertake a strategic planning exercise. The AusAID funded Indonesia Infrastructure Initiative (IndII) has been assisting in this process with projects to prepare a strategic ATM Master Plan and assist in the implementation of the Open Skies concept developed by ASEAN (for more about Open Skies, see "Open Skies and Indonesian Airlines" on page 22 of this issue). The resulting recommendations address not only the physical infrastructure systems described in this article, but also the human resources, training, policy and regulations that are just as crucial to successfully managing Indonesia's future aviation challenges.

The Future

Because of the dynamic nature of the aviation industry and its critical importance to the economic growth and wellbeing of Indonesia, planning and development of supporting infrastructure is certainly not a one-off activity. At the same time that current plans are implemented, the changing nature of the industry must be carefully and constantly monitored to ensure that future needs are met in a timely, effective and, most importantly, safe manner.

The technologies available to support aviation continue to evolve, challenging the aviation industry to make the best use of those technologies to ensure safe operation of the aircraft and airspace. ■

About the author:

Mike Gahan is an aviation operations and regulatory specialist with 41 years' experience in military and civil aviation regulation, operations and management. During 23 years' service in the Royal Australian Air Force (RAAF), he attained the rank of Wing Commander and worked in a wide variety of ATC operational, training and staff appointments, retiring in 1993 as the Staff Officer Air Traffic Services. His staff appointments included Executive Officer of an operational fighter base. He is a graduate of the RAAF Command and Staff Course.

Mike has broad and detailed experience in international airspace standards and regulations, advanced technology systems and safety management systems. He also has considerable experience in airports certification, standards and regulation, both in Australia and overseas. He represents and provides regulatory and operational advice to several companies involved in providing technology solutions to airports and air navigation service providers.

Mike's professional memberships include the Australian Institute of Management, the Military Air Traffic Control Association, associate membership of the UK Guild of Air Traffic Control Officers, and professional member status with the Air Traffic Control Association (ATCA). He was the Area 8 (Asia Pacific) Director of ATCA during 2002–2008. In 2008 he was awarded the ATCA Chairman's Citation of Merit for his international activities to improve ATM in developing countries.

Mike has been involved in aviation safety and infrastructure projects in Indonesia since 2009 with both IndII and the Indonesian Transport Safety Assistance Package.

A Partnership for Safer Skies

Australia's Indonesia Transport Safety Assistance Package is working with Indonesian counterparts to restructure Air Traffic Management and improve safety. • By Devi Asmarani

Inside Sultan Hasanuddin International Airport in South Sulawesi. Makassar uses the same air traffic management technology as Australia, helping to strengthen aviation bonds between Indonesia and Australia. *Courtesy of tokyofoodcast on flickr*

Forty to fifty percent of Australia's international air traffic flies through Indonesian airspace, and Australia wants to be a good aviation neighbour. Because both Australia and Indonesia support improved air transport safety standards, in 2007 the Australian Government established the Indonesia Transport Safety Assistance Package (ITSAP) to assist Indonesia in its efforts to improve air transport safety standards in the country.

ITSAP is carrying out a range of activities, but according to ITSAP's Project Manager in Jakarta, David Ramsay, its "flagship project" is supporting Indonesia's efforts to restructure the way Air Traffic Management is conducted by separating the service provider and the regulatory functions.

ITSAP was established after a string of major transport accidents, including a Garuda air crash in 2007 in Yogyakarta that killed several Australian diplomats and citizens. The program started out with a A\$ 24 million grant. Last year, Canberra extended the support for the next four years with a further A\$ 14.5 million. ITSAP also operates projects in maritime and land transport safety, although its major focus is air transport.

Three different agencies are involved in providing aviation safety assistance under ITSAP. The Civil Aviation Safety Authority (CASA) is the regulator for civil aviation safety in Australia, and its officials have been working with all directorates in the Directorate General of Civil Aviation (DGCA) in Indonesia's Transportation Ministry to help them become better regulators. Airservices Australia is a government-owned corporation that provides Air Traffic Management and related services and is a potential model for the future structure of Indonesia's Air Traffic

Management organisation. The Australian Transport Safety Bureau (ATSB) is an independent national transport accident investigation body, similar to what Indonesia's National Transport Safety Committee (NTSC) is shaping up to be. NTSC is under Indonesia's Transportation Ministry but is currently transitioning to become a fully independent body that reports to the President.

Notes Ramsay, "We're in a strong position to do this because Australia has been through a similar change over the last 20 years, from a Department of Civil Aviation organisation that was rather like DGCA in which the government did everything – from running airports, providing air traffic control to regulating all the services and airlines – to the current structure."

"The model in many parts of the world now is to separate the regulator from the service provider, even if it is within government. And it's one of the aspects that is still in transition here," he added.

DGCA manages most airports in the country, except for the 26 airports run by state-owned enterprises PT Angkasa Pura I and II.

Key Points

In 2007 the Australian Government established the Indonesia Transport Safety Assistance Package (ITSAP) to assist Indonesia in its efforts to improve air transport safety standards in the country. Its "flagship project" is supporting Indonesia's efforts to restructure Air Traffic Management by separating the service provider and the regulatory functions.

Three different agencies are involved in providing aviation safety assistance under ITSAP: the Civil Aviation Safety Authority, which is the regulator for civil aviation safety in Australia; Airservices Australia, a government-owned corporation that provides Air Traffic Management and related services and is a potential model for the future structure of Indonesia's Air Traffic Management organisation; and the Australian Transport Safety Bureau (ATSB), an independent national transport accident investigation body that is similar to Indonesia's National Transport Safety Committee (NTSC).

Having gone through a similar transition during the past 20 years, Australia is well positioned to assist Indonesia change from a structure where one government entity oversees all aspects of aviation to a model, now adopted in many parts of the world, where regulatory and service provision functions are separate.

Under Law no. 1/2009 on Aviation, a Single Air Navigation Service Provider (SANSP) is being created by combining the air navigation service elements of Angkasa Pura I and II and Directorate General of Civil Aviation-managed airports. SANSP is to be financially independent and able to retain its revenue.

Much of ITSAP's success is in conducting training and educational programs for those in safety-sensitive positions in the transport industry. So far it has trained over 1000 personnel in all modes of transport, including maritime and road safety.

Accident investigation is another area on which ITSAP's aviation program focuses. Since its inception, a number of NTSC members have participated in ATSB's Diploma of Transport Safety Investigation or specialist training.

A Single Service Provider

The plan, which is stipulated in Law no. 1/2009 on Aviation, is to establish a Single Air Navigation Service Provider (SANSP) by combining the air navigation service elements of Angkasa Pura I and II and DGCA-managed airports.

The legislation says the move should be finalised by January 2012, but the transition has been delayed by a number of difficult decisions, such as what type of entity the new government enterprise will be and which ministry will control it.

The law specifies that the SANSP be financially independent and able to retain its revenue (air navigation service charges are currently about USD 0.55 per tonne per air nautical mile travelled through Indonesian airspace) to enable it to procure, own, and maintain its own equipment, and to pay its employees a competitive wage.

Currently, there is a wide income gap between DGCA air traffic controllers and their counterparts in the state-owned enterprises. As public servants, the DGCA air traffic controllers are paid about 25 percent of the salaries of Angkasa Pura I or II air traffic controllers. Other issues such as pension entitlements further complicate the issue.

But Ramsay said ITSAP continues to support the process because good management and leadership of the regulatory system in the civil aviation sector are essential to improving safety standards. "We're supporting the Single Air Navigation Service Provider because having a transparently managed organisation that can charge fees and retain those fees to invest in appropriate equipment and good training is fundamental to providing a first class service."

There is no shortage of talented people in the aviation industry in Indonesia, he said, adding that in some cases air traffic controllers and maintainers work with antiquated equipment – particularly in Jakarta – but manage to keep the system going.

Air traffic management is a particular area where Australia can contribute because the Air Traffic Management agencies of both countries have ongoing operational relationships due to shared borders, and because the same type of computer-based system is used in Australia and in Makassar.

Training and Investigation

Much of ITSAP's success is in conducting training and educational programs for those in safety-sensitive positions in the transport industry. So far, it has trained over 1000 personnel in all modes of transport, including maritime and road safety.

Accident investigation is another area on which ITSAP's aviation program focuses. Since its inception a number of NTSC members have taken part in ATSB's Diploma of Transport Safety Investigation or specialist training.

ATSB provided training in general investigation skills and in specialised disciplines, such as the analysis of Flight Data Recorders and Cockpit Voice Recorders. Participants also had the opportunity to work alongside their Australian counterparts.

Recently, ITSAP facilitated the ATSB and NTSC Human Factors Workshop developed by a number of aviation doctors, psychologists and other specialists. The subject of "Human Factors in Accident Investigation" is about understanding why people make mistakes due to underlying causes such as spatial disorientation and fatigue.

"We're really pleased with this workshop because we've trained a number of excellent trainers and established something that will be truly sustainable in Indonesia," said Ramsay.

ITSAP has also assisted its Indonesian counterparts to catch up on a backlog of some 40 accident investigation reports that have now been published internationally via the International Civil Aviation Organization website, he added.

Other training included an education course for Indonesian police about the legal aspects that separate a police investigation from an NTSC/ATSB accident investigation. The latter seeks to establish what happened and how to prevent another such accident, while the former looks at who is at fault and may result in prosecution.

The education course for the police also instructed them on how to conduct initial activities on crash sites. Because of geographical constraints, NTSC often cannot arrive quickly at all accidents. Police need to be aware of what to do at a crash site, including how to protect their own safety when evacuating survivors/victims, and how to document the crash site without unnecessarily disturbing it.

One of ITSAP's current major projects is the production of a Tropical Mountainous Terrain Flying Operations Training Kit, which was launched in November 2011. "There are things that can be downright dangerous when flying in tropical mountainous terrain like Papua and Sumatera, where the weather changes very suddenly," said Ramsay. "When you have remote area public service operations subsidised by the Government, obviously there are going to be standards that are challenged if not compromised."

 "So offering guidelines on minimum standards and the added dangers of visual flight rules operations in tropical mountainous terrain is very important," he added. ■

About the author:
Devi Asmarani is a former correspondent for *The Straits Times* who now freelances for a variety of leading publications in Indonesia.

OPEN SKIES AND INDONESIAN AIRLINES

Indonesian airlines are largely focused on domestic service. Taking advantage of new opportunities under Open Skies will present some challenges • By Chris Whittle

For most Indonesian airlines, the domestic market is by far the most important.
Photo courtesy of Garuda Indonesia

Indonesia is experiencing a growing population and increasing economic prosperity. This, combined with the nation's unique geographical situation – more than 18,000 islands scattered across an expanse of over 5,000 km – will increase its "propensity to fly". (For a detailed explanation of what this term means, see "Growing Traffic, Growing Needs" on page 3.) Aviation is the critical link to efficiently connect Indonesia's nearly 240 million inhabitants to each other and to the rest of the world. Between 2010 and 2014, Indonesia is expected to be the sixth fastest growing market for international passengers. In 2014, Indonesia will rank as the ninth largest domestic market and among the top 10 for international freight.

Key Points

The implementation of an ASEAN Open Skies Agreement, due to occur in 2015, will not fully open up the market, but it will be more liberal than existing agreements and will result in a tougher competitive regime.

The Indonesian airline sector includes 16 scheduled passenger airlines, of which seven are likely to be affected by the ASEAN Open Skies Agreement. Two of these, Garuda Indonesia and Indonesia AirAsia, are already actively involved in the provision of international air services. The other five airlines – Lion Air, Sriwijaya Air, Batavia Air, Wings Air and Merpati Nusantara – are strongly focused on the domestic passenger market.

With the exception of Indonesia AirAsia, the services that Indonesian airlines provide to destinations in other ASEAN countries are only a small part (5 percent) of their total seat capacity. Some Indonesian airlines are rapidly increasing their fleet sizes, but except for Indonesia AirAsia, most new seat capacity is being deployed into domestic markets.

Most bilateral Air Service Agreements between Indonesia and ASEAN member states have capacity and frequency limitations, which may have protected Indonesian carriers against competition from the larger ASEAN hub-carriers, particularly Singapore Airlines.

It may be difficult for Indonesian airlines to realise the full potential benefits of Open Skies, due to airport infrastructure constraints and the workings of the Indonesian marketplace. Most Indonesian carriers consider that the opportunity for profitable growth will come from domestic expansion, and therefore seek to delay international route access and capacity expansion until their domestic growth has matured. They support a gradual introduction of Open Skies across Indonesia to ASEAN markets, so they can continue to concentrate on domestic growth in the short to medium term.

The potential for aviation in Indonesia is enormous and alongside its burgeoning domestic market, its strategic location at the heart of Southeast Asia gives this market added significance. Thus, the implementation of an ASEAN Open Skies Agreement, due to occur in 2015, is an important event for Indonesian airlines.

Open Skies refers to a progressive set of rights (called "freedoms") granted by countries to airlines from other nations – beginning with the freedom to fly over a country's territory (the first freedom) and progressing to permission for a foreign carrier to operate flights that begin and end in another country (the ninth freedom). (See the box on page 25 for a complete explanation of the nine Open Skies freedoms.)

ASEAN Open Skies is not truly open skies, even for those airlines domiciled in ASEAN member states, because there is no provision for the seventh, eighth or ninth freedoms. ASEAN Open Skies is therefore not as liberal as the EU single aviation market, but it will be more liberal than the existing bilateral and other agreements now affecting ASEAN airlines.

ASEAN Open Skies will provide for unlimited third, fourth and fifth freedom access to all ASEAN states by 2015. This will result in a tougher competitive regime for all ASEAN airlines. The higher commercial risks are balanced by potentially higher rewards.

As ASEAN proceeds with its liberalisation policy, it is important that Indonesia be well prepared with a safe air transport industry based on aviation infrastructure that meets global standards. This preparation requires the Indonesian government to put in place coordinated policy measures to ensure safety and adequate infrastructure, both on the ground and in the air.

The Indonesian air transport industry is already developing rapidly to meet growth in demand. This rapid development, compounded by the stimulus that the introduction of Open Skies will bring, further emphasises the need for close attention to safety oversight. The urgent attention required for safety measures is evidenced by the fact that between 2005 and 2010, Indonesia recorded a total of 33 accidents, and that in 2010, Indonesia accounted for 1.4 percent of global traffic but 4 percent of all accidents.

Efforts have been made in recent years to improve Indonesia's safety record. A positive indication of the success of this work is seen in the removal of five Indonesian airlines from the European Union's list of banned airlines. (Airlines on the list are not allowed to fly other member countries' airspace.)

Indonesian Airlines
The Indonesian airline sector comprises scheduled passenger, scheduled cargo and non-scheduled airlines. There are 16 scheduled passenger airlines, of which seven are likely to be affected by the ASEAN Open Skies Agreement. These seven airlines include two airlines that are already actively involved in the provision of international air services, Garuda Indonesia and

Indonesia AirAsia. Garuda and Indonesia AirAsia combined represented almost 80 percent of international scheduled passengers carried by all Indonesian airlines in 2010. International passengers accounted for 20 percent of Garuda's total passenger traffic and 72 percent of Indonesia AirAsia's (see Figure 1).

Figure 1: Passengers Carried by Selected Indonesian Airlines in 2010
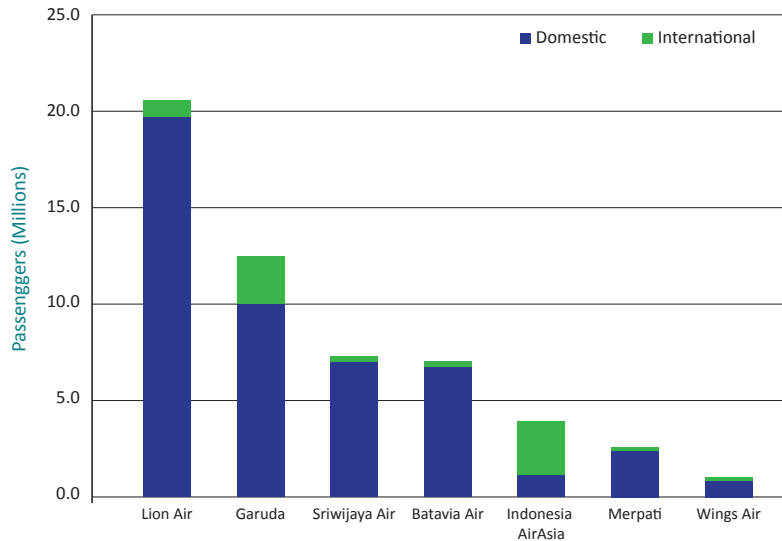
Source: Directorate General of Civil Aviation

The other five airlines – Lion Air, Sriwijaya Air, Batavia Air, Wings Air and Merpati Nusantara – are strongly focused on the domestic passenger market, with international passengers accounting for less than 5 percent of each airline's total passengers in 2010.

The three scheduled cargo airlines are relatively minor players in terms of fleet and available capacity. Whilst air freight services within ASEAN are liberalised through the Multilateral Agreement on the Full Liberalization of Air Freight Services, this agreement has not yet been ratified by the Government of Indonesia.

The non-scheduled airlines mainly perform niche operations that are unlikely to be impacted by the ASEAN Open Skies Agreement.

Overall, the services that Indonesian airlines provide to destinations in other ASEAN countries are only a small part (5 percent) of their total seat capacity. (The figure is even smaller [3 percent] for international destinations outside ASEAN.)[1] The picture is much different for Indonesia AirAsia, which currently has the largest commitment to the ASEAN market (see Figure 2). This airline accounts for 54 percent of the seats on planes flying between nations of ASEAN that are offered by Indonesian carriers. Fifty-five percent of Indonesia AirAsia's total capacity is serving the ASEAN market.

Some Indonesian airlines are rapidly increasing their fleet sizes, but with the exception of Indonesia AirAsia, most new seat capacity is being deployed into domestic markets. During the

period November 2010–November 2011, the aggregate fleet size of the seven largest Indonesian airlines increased by 16 percent. Some carriers are either ordering or signing letters of intent to acquire smaller regional aircraft which could serve new, lower-volume intra-ASEAN markets.

Figure 2: Total Seats Offered by Selected Indonesian Airlines to ASEAN Countries (March 2011)

Sriwijaya Air 3.2%
Merpati Air 1.7%
Batavia Air 4.5%
Lion Air / Wings Air 17.6%
Indonesia AirAsia 53.5%
Garuda 19.5%

Source: DGCA
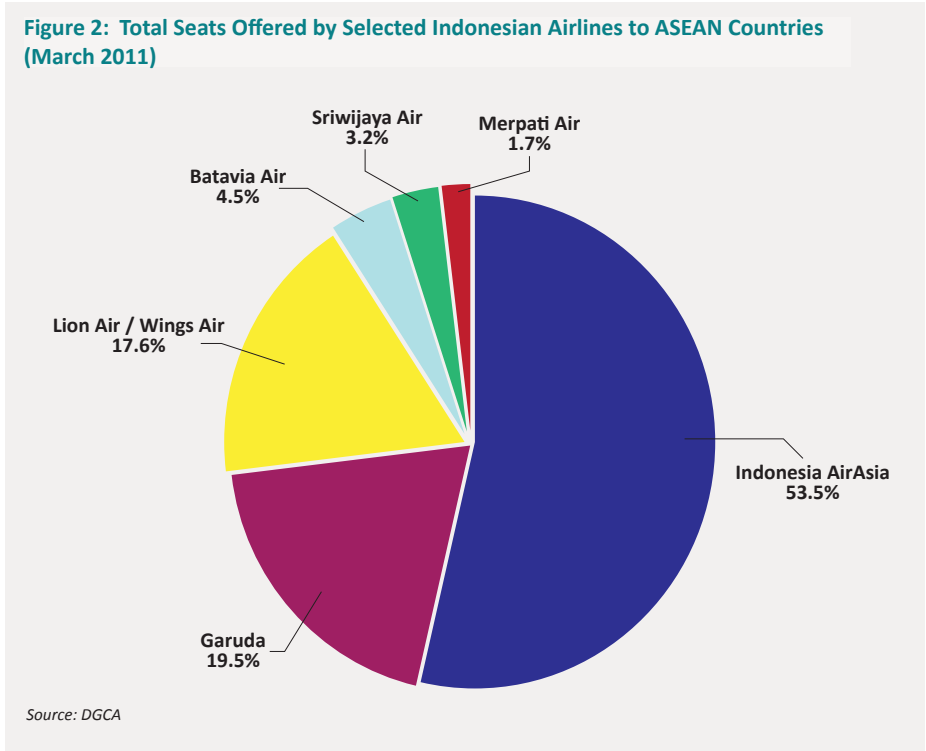
The Nine Freedoms of the Air
1. The right of an airline from one country to fly over the airspace of another, without landing
2. The right to refuel or complete maintenance on the way to another country
3. The right to fly into another country
4. The right to fly from another country into an airline's home country
5. The right to fly between two foreign countries, as long as the flight begins or ends in an airline's home country
6. The right to fly between two foreign countries with a non-technical stop (not for refuelling or maintenance) in the airline's home country
7. The right to fly between destinations in two foreign countries, without a stop in the airline's home country
8. The right to fly between two destinations in a foreign country, with continuing service to the airline's home country
9. The right to fly between two destinations in a foreign country, without continuing service to the airline's home country

Opening up More Capacity

Most bilateral Air Service Agreements between Indonesia and ASEAN member states have capacity and frequency limitations that are applied through a Confidential Memorandum of Understanding (CMOU). Arguably, these limits may have protected Indonesian carriers from capacity and frequency increases by the larger ASEAN hub-carriers, particularly Singapore Airlines. The Indonesia-to-Singapore and (to a lesser extent) Indonesia-to-Kuala Lumpur city pairs are the most constrained: airlines on both sides are operating at close to the maximum number of services permitted by the CMOU. The Jakarta-to-Singapore route is the city pair most likely to see more seats offered immediately once the Open Skies Agreement is implemented.

Singapore Airlines and Thai Airways operate aircraft of a much larger average size than Indonesian carriers do. This is because their operations are primarily long and medium haul in nature. Indonesian airlines already find it difficult to compete against carriers such as Singapore Airlines. Singapore Airlines is viewed as the airline most likely to benefit from Open Skies, through being able to fly more international passengers from its hub at Changi Airport on to further ASEAN destinations. As Singapore Airlines adds more international capacity, this may impact connecting passenger traffic that is currently using the domestic services of Indonesian airlines.

Open Skies, Diverse Countries

A common liberalisation policy for ASEAN States faces significant challenges, largely due to the diversity in member States' aviation-related capacities and priorities. On the one hand, there are States like Singapore and Brunei, which have non-existent or negligible domestic markets to protect, and effectively have only one international airport/destination to offer. These States tend to be extremely liberal in advocating free market access, particularly Singapore which has a very successful national carrier and several new low-cost carriers.

On the other hand, States like Indonesia, the Philippines and Vietnam have huge domestic markets and numerous large cities from which international operations can be mounted. These States tend to be more protective of their markets.

On the part of the carriers, there are established players such as Singapore Airlines (SIA), Thai Airways International (THAI) and Malaysia Airlines (MAS) which have extensive global networks, while states such as Cambodia, Laos and Myanmar have either fledgling or limited-network international carriers. Amidst such disparities in capacity, national airlines exert varying degrees of influence over their governments…Thus, it is unsurprising that ASEAN member States display such markedly diverse levels of commitment toward air services liberalisation.

– Reprinted with permission from "Prospects for a Single Aviation Market in Southeast Asia" by Alan Khee-Jin Tan in Annals of Air and Space Law, vol. XXXIV. Dr. Tan is Associate Professor and Vice-Dean, Faculty of Law, National University of Singapore.

Ready to Benefit?

As things now stand, it may be difficult for the full potential benefits of Open Skies to be realised, due to airport infrastructure constraints and the workings of the Indonesian marketplace. Airport capacity, particularly at Jakarta's Soekarno-Hatta Airport, is very constrained. The opening hours of most other Indonesian international airports are restricted, which has an impact on airline schedule development and operating efficiency. As to the marketplace, a combination of currency restrictions, the limited use of credit cards by consumers, and extended credit facilities offered by the travel trade will slow the development of sales over the internet.

Most Indonesian carriers consider that the opportunity for profitable growth will come from domestic expansion, and therefore seek to delay international route access and capacity expansion until their domestic growth has matured. They support a gradual introduction of Open Skies across Indonesia to ASEAN markets, and a gradual removal of capacity and frequency constraints that are currently applied on a bilateral basis, so that they can continue to concentrate on domestic growth in the short to medium term. ■

NOTES

1. These figures are based on data from March 2011 airline schedules.

About the author:
Chris Whittle is a Principal Project Manager for Mott MacDonald. He is an air transport economist specialising in economic, strategic planning, policy formulation and development studies for the industry. He has worked on a number of demand forecasting, due diligence, strategic planning and related studies for the financial sector, regulatory groups, governments, airlines, airports and others with an interest in airport investment and development.

Chris led Mott MacDonald's study for the AusAID funded Indonesia Infrastructure Initiative on the impact of the implementation of the ASEAN Open Skies policy on the Indonesian air transport industry. Chris has previously worked in senior planning, marketing and commercial management positions with British Caledonian Airways, including responsibility for air cargo strategy and marketing. He is a regular presenter at conferences on all aspects of aviation, including policy and strategic developments.

Chris is a Chartered Member of the Institute of Transport and Logistics.

Sustainable Airport Development: The Challenges Ahead

As they expand to meet increasing demands, Indonesia's airports need to consider environmental impact, capacity and efficiency, and safety and security. • By Natanael Ljung

Sometimes airport capacity can be increased through means such as personnel training or using new procedures, instead of building new physical infrastructure.
Courtesy of IndII

Current air traffic forecasts for Indonesia indicate that the number of passengers annually will increase from just above 100 million today to over 300 million by 2025. In order to cope with this expected growth, several Indonesian airports will need to expand significantly. This is particularly true for the five airports that Indonesia has agreed to open up under the terms of the ASEAN Open Skies Agreement in 2015, namely Soekarno-Hatta in Jakarta, Juanda in Surabaya, Ngurah Rai in Bali, Sultan-Hasanuddin in Makassar and Sepinggan in Balikpapan.

The larger the number of projected passengers that will use the airport, the greater the size of the development that will be necessary to meet future demand. This means that Soekarno-Hatta will have to grow the most, to the point where a completely new airport might be necessary. The other four airports will require, to varying degrees, increased terminal capacity, additional aircraft parking positions, infrastructure development, and improved routines and working methods.

Achieving the necessary development will require extraordinary efforts from the infrastructure owners and from other stakeholders. At the same time, developers now have an opportunity to not only increase airport capacity but also to transform airports into world-class examples of sustainable infrastructure.

Sustainable Development

Today's airports are complex operations where economic, social and environmental systems need to interact efficiently, not only within the airports themselves but also with the surrounding world. Sustainable development is based on balancing strategies. This means taking a holistic approach to present and future challenges that considers economic growth, social equity and environmental management. It also means being willing to adopt new strategies when they offer incremental or comprehensive improvements. The components of a successful development process include: clear statements of intent; cooperation among stakeholders; on-going monitoring; scheduled reviews; and access to all needed toolkits, information and training.

The three cornerstones of sustainable airport development are: managing environmental impact; maximising capacity and efficiency; and improving safety and security. Each of these factors should be given equal weight when decisions are taken. A brief discussion of strategies that can be used to promote these three goals follows in the sections below.

Environmental Impact

Even as demand for transport is constantly rising, environmental impact must be continuously considered during construction, operation, and maintenance of the aviation system. Infrastructure investments, technical improvements, and operational changes may all offer solutions to environmental concerns. But the holistic approach requires that profitability and safety concerns not be overlooked when environmental measures are being considered.

Key Points:

Indonesian airports, especially those that will be opened up under the ASEAN Open Skies Agreement in 2015, will need to develop substantially to meet projected future demand. They will require increased terminal capacity, additional aircraft parking positions, infrastructure development, and improved routines and working methods. This is an opportunity to transform Indonesia's airports into world-class examples of sustainable infrastructure.

Sustainable development means taking a holistic approach to economic growth, social equity and environmental management. It means adopting new strategies as needed and operating with clear statements of intent; cooperation among stakeholders; on-going monitoring; scheduled reviews; and access to all needed toolkits, information and training.

The three cornerstones of sustainable airport development are: managing environmental impact; maximising capacity and efficiency; and improving safety and security. A Strategic Environmental Assessment (SEA) and an Environmental Impact Assessment (EIA) should be conducted, followed by a deeper investigation into possible environmental impacts and mitigating measures. Capacity and efficiency can be increased through building new physical infrastructure but this is an expensive option. Before this is done, operations should be analysed to determine if there are strategies that can be applied to improve capacity such as personnel training or giving airlines incentives to schedule their flights differently. The main challenge for safety and security is in identifying the main concerns. Management systems mandated by the International Civil Aviation Organization can assist with this process.

A balanced strategy where environmental impact, effectiveness and capacity, and safety and security are fully considered and equally important, lays a foundation for long term sustainable infrastructure development.

Consideration of environmental impact should be built in to the development process. As a first step, a Strategic Environmental Assessment (SEA) and an Environmental Impact Assessment (EIA) should be introduced. The SEA focuses on policy and planning and the EIA focuses on physical infrastructure development. Both are used in the early stages and they are potentially very powerful tools for determining the long term environmental impact of infrastructure development.

When Indonesian airports are expanded, an EIA should be undertaken and the results should be used to structure an Environmental Management Plan that addresses any concerns that the EIA identifies.

As a second step, a deeper investigation should be undertaken at each airport in order to map the environmental impact and possible responses. These responses may include a broad range of "green" measures such as developing public transportation, improving waste management, and increasing environmental awareness amongst owners, personnel and stakeholders.

Capacity and Efficiency

The capacity of an airport is not a static value. It varies with the actual circumstances under which the airport operates. Characteristics such as pilot behaviour, weather conditions, the mix of aircraft in the sky, and traffic schedules can influence an airport's capacity at a given time. Lack of capacity is already a major obstacle for several airports and the problem will worsen with growing air transportation demand. Solving the problem by construction of new physical infrastructure is a costly choice that must be carefully thought out before being implemented.

Instead, the first step should be to evaluate whether the existing infrastructure is being fully utilised. Latent capacity can be identified and utilised by applying theoretical knowledge and best practices that have been developed for runway, taxiway and apron operations.[1] In some situations, personnel training and streamlining the routines and methods that are used can give significantly improved capacity without additional construction. Changes to the fees charged to airlines can also help, by giving airlines incentives to schedule their flights at times when more capacity is available.

A simple example of how capacity can be increased by changes in operations relates to the actions taken when an aircraft is being serviced between flights. At this time, several different service providers are in action around the aircraft. It is fairly common for delays to occur because of misunderstandings, or a lack of means by which different providers can communicate. The result can be blocked gates and disrupted traffic flow.

One way of dealing with this problem is Collaborative Decision-Making (CDM). CDM establishes procedures that lead to sharing information and working together more transparently and efficiently. CDM can improve the efficiency of operations at an airport, particularly during the sequence of steps that occur prior to departure. The increased operational efficiencies resulting from collaborative approaches also result in welcome environmental benefits.

Safety and Security

The most important factors in building and maintaining confidence in air transport systems are safety and security. Together they form the cornerstone for development initiatives and they are the foundation of all the economic and social benefits within the air transport system.

The main challenge lies in identifying the main safety and security concerns. Solutions can be found in the safety management systems and security management systems that are mandated by the International Civil Aviation Organization (ICAO). These systems must contain descriptions of the airport's policies, how the safety and security systems are structured, the roles and responsibilities of different personnel, performance targets, and plans for monitoring those targets. Further, there should be a description of how the system will be implemented and maintained.

By designing and implementing a comprehensive safety system that fulfils the requirements of an ICAO Certification process (ICAO Doc 9774 AN/969), along with compatible security initiatives, a great deal can be achieved. Although the need for state-of-the-art security technologies and processes is self-evident, the most important objective is still to create a workplace culture that emphasises safety and continuously strives for safety improvements.

Conclusions

Sustainability is about understanding and balancing the visions, goals and needs of all stakeholders. Therefore it is necessary to adopt a holistic perspective when developing infrastructure systems for the future. A balanced strategy where environmental impact, effectiveness and capacity, and safety and security are fully considered and equally important, lays a foundation for long term sustainable infrastructure development. ∎

NOTES
1. The "apron" is the part of an airport intended to accommodate the loading and unloading of passengers and cargo; the refueling, servicing, maintenance and parking of aircraft; and any movement of aircraft, vehicles and pedestrians necessary for such purposes. Source: http://aviationglossary.com/

About the author:
Natanael Ljung holds a Master of Science in Civil Engineering and is currently a senior airport consultant at LFV Aviation Consulting. He has more than 15 years of experience in airport planning, airport design, and airport operations, including terminal logistics and baggage handling, safety management systems, traffic forecasting, and environmental projects. In addition he spent more than 18 months as an Operations Manager at Norrköping Airport in Sweden.

Internationally, he has worked in several European and African countries. From 2006–2008 he led a team that provided support to Erbil International Airport in Kurdistan, Iraq. He has also been involved in several projects in Indonesia, amongst them the Bali Airport Development Project where he acted as team leader. He also participated in an investigation of the preparedness of seven Indonesian airports for the implementation of the ASEAN Open Skies Agreement.

Preparing Indonesian Air Traffic Management for ASEAN Open Skies

The policy and regulatory environment, infrastructure, and human resources must all be in good condition if Indonesia is to benefit from Open Skies. • By Novaro Martodihardjo

The Directorate General of Civil Aviation is working to upgrade Indonesia's Air Traffic Management system in anticipation of increased traffic under Open Skies.
Courtesy of Garuda Indonesia

The ASEAN Open Skies Agreement will take effect in the region in 2015. (For details concerning the specific nature of this agreement, see "Open Skies and Indonesian Airlines" on page 22.) The Government of Indonesia (GoI) generally supports the policy. However, as usually happens with any major initiative, there are varied opinions about it. In various seminars devoted to the topic, GoI acknowledges the need to prepare for globalisation, including in the air transport sector. Indonesian airline operators, on the other hand, have expressed concerns over how they will be affected by Open Skies.

Each of the elements of the ASEAN Open Skies Policy, including security, safety, efficiency, services, and of course its financial impact and the way in which these elements interact, should be scrutinised. It is important to ensure that the domestic air transportation industry is prepared to operate in a competitive market and take advantage of the potential benefits that Open Skies can offer.

According to the Airport Council International, the number of aircraft (both commercial and non-commercial) worldwide is growing annually at a rate of about 2 percent. For the Asian region, according to a study conducted by the Japan Aircraft Development Corporation, the figure may reach 6 percent per year, an astonishing percentage.

At such a growth rate, airline traffic both in the skies and in airports will increase to such a level that necessary precautions should be undertaken in order to minimise ground and airborne delays, and ensure smooth and efficient operations.

ASEAN Open Skies

In this article, the author examines Indonesia's state of preparedness for Open Skies with respect to aviation safety, in particular looking at the issue of the management of civilian flight navigation.

Air Traffic Management (ATM) is part of the air navigation services provided to facilitate and conduct smooth and efficient flight operations, from departing one airport to arriving at the destination airport. Obviously aviation safety standards are always of paramount importance to ATM.

ATM services provided for domestic flights should be equal to those provided for international flights, across all airspace used by civil aviation. Therefore, virtually all requirements pertaining to the services provided are based upon international agreements administered through the International Civil Aviation Organization (ICAO).

Key Points

This article discusses three topics related to enhancing Indonesia's Air Traffic Management (ATM) system: policies and regulations, human resources, and infrastructure.

The Directorate General of Civil Aviation (DGCA) is the policy maker/regulator. According to the DGCA Blueprint for the period 2010–2014, DGCA will focus the development of its ATM policies on three major issues: harmonisation of the Ujung Pandang and Jakarta Flight Information Regions; development of air traffic flow, and management in accordance with the Asia-Pacific regional strategy. Not all measures specified in the Blueprint for 2005–2009 are complete, which affects subsequent progress. However, a number of technical regulations related to safety have been issued along with related documents such as a standards manual. DGCA must now turn its attention to establishing the policies and recommendations needed to comply with an upcoming amendment, scheduled for November 2012, to the International Civil Aviation Organisation's (ICAO) format for flight plans.

Human resources are an essential part of providing high quality services. DGCA must determine how many air traffic controllers it will need in the coming years based on growth forecasts and airspace/airport capacity, and adjust its recruitment, education and training policies to match. The subject of worker morale in light of proposed changes to the structure of ATM should also not be overlooked.

The provision of physical infrastructure must be preceded by the creation of appropriate policies and operational concepts. Broadly speaking, the infrastructure for ATM service in Indonesia is obsolete, both in terms of technology and operational needs. Secondary Surveillance Radar (SSR) technology is beginning to be used but it needs to be supplemented by a comprehensive operational concept on how these surveillance capabilities may be utilised in the provision of ATM services. A trial of Automatic Dependent Surveillance/Broadcast (ADS/B) technology has been conducted but it is not yet being implemented. It would be advantageous for DGCA to review the utilisation of ADS/B technology within the framework of ATM service, by taking note of ICAO recommendations, and observe the preparatory steps that have been taken by neighbouring countries such as Singapore and Australia.

Air traffic movement reports at Soekarno-Hatta Airport for 2010 recorded a growth of 1–2 percent. With the implementation of the ASEAN Open Skies in 2015, air traffic in the Jakarta and Ujung Pandang Flight Information Regions (FIR) is likely to increase, especially in the five major airports: Jakarta, Medan, Surabaya, Bali and Makassar. (See "Growing Traffic, Growing Needs" on page 3 of this issue for more insights into the topic of Indonesia's expected growth in demand for air transport.)

Air Traffic Management

The acronym CNS is often used in discussions about aviation. It stands for Communication, Navigation and Surveillance. In simple terms, CNS can be defined as the provision of infrastructure within the framework of ATM services, whereas ATM itself consists of three types of services, namely Airspace Management, Air Traffic Control, and Air Traffic Flow Management, each of which has a key role in ensuring smooth and efficient flight operations.

Under Open Skies, the western region of Indonesian air space is predicted to receive a heavier flight traffic load than the eastern region, because of the relative location of major airports in the ASEAN region such as Singapore, Kuala Lumpur and Bangkok. Singapore is a hub for flights in the ASEAN region, with many flights going to and from major airports in Indonesia as well as to and from Australia and New Zealand.

This article discusses three topics: policies and regulations, human resources, and infrastructure. The material presented originates in documentation available at Directorate General of Civil Aviation (DGCA) and from observations in the field.

The topic of ATM cannot be separated from the roles of DGCA (as policy maker/regulator); PT Angkasa Pura I (as the Ujung Pandang FIR service provider); and PT Angkasa Pura II (as the Jakarta FIR service provider).

A portrait of DGCA readiness to serve as policy maker/regulator in addressing the ASEAN Open Skies Policy can be found in Chapter VI of *Cetak Biru Direktorat Jenderal Perhubungan Udara 2005–2024* (DGCA Blueprint 2005-2024), which gives a period-by-period account of DGCA's activities plan. Activities conducted by service providers must be in keeping with this plan. Let us review the topics of policies and regulations, human resources, and infrastructure with this Blueprint in mind.

Policies and Regulations

According to the Blueprint for the period 2010–2014, DGCA will focus the development of its ATM policies on three major issues: harmonisation of the Ujung Pandang and Jakarta FIRs; development of air traffic flow; and management in accordance with the Asia-Pacific regional strategy. It is not clear whether the policy direction for 2015–2019 will just be a continuation of the prior period's activities. However, both the 2010–2014 and 2015–2019 periods will be important for the implementation of Open Skies.

As 2011 draws to a close, it is appropriate to examine whether preparations seem to be underway in anticipation of ASEAN Open Skies. As a matter of fact, the DGCA 2005–2009 policy was directed towards measures to improve ATM, such as planning for the development of a centralised air traffic flow management system. But so far this has yet to be realised, and that of course will not be consistent with plans for the subsequent period.

During 2009 and 2010, DGCA issued a number of technical regulations related to ATM, as outlined in the Civil Aviation Safety Regulations (CASR). Examples include CASR Part 69, CASR Part 91, CASR Part 170, CASR Part 171, CASR Part 172, CASR Part 174, and a number of derivative documents, in the form of a Manual of Standards (MOS). Technical directions on the implementation of ATM have in fact been sufficiently laid out in CASR Part 170 along with the MOS, but they have not yet been fully implemented in the field.

In addition to the above mentioned policies and regulations, there is one very important international regulation to be implemented. This came out of the 19th session of the ICAO's Asia/Pacific Air Navigation Planning and Implementation Regional Group in September of 2008, which among other things identified and agreed to Amendment 1 of the 15th edition of the Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM Doc. 4444). In essence, this amendment is a change to the format of the ICAO flight plan.

A flight plan is submitted by the aircraft operator/airline to the ATM service provider. The flight plan contains, among other elements, the planned departure time (day, month, year and hour), destination, selected route plan, and the planned time of arrival at the destination. Based on this information, the ATM service provider can then conduct proper planning and be aware of whether at a certain time and specific location (at the destination or departure airport) constraints (i.e. a delay) will occur.

With the tendency of aviation traffic to increase over time, particularly with the advent of Open Skies, a flight plan is a very important factor in managing air traffic in a strategic and technical manner.

The implementation of this amendment to the flight plan format in November 2012 may affect the operations of ATM service providers and airline/other carrier flight operations. So DGCA is required to immediately establish policies and related regulations, and PT Angkasa Pura I and PT Angkasa Pura II must take these into account in their operations.

Human Resources

We all understand that the quality of services provided very much depends on the quality of human resources – as the old saying goes, "It's the man behind the gun who does the work" – as well as the availability of a sufficient quantity of human resources.

It becomes somewhat difficult to determine the human resource requirements if policies and procedures on ATM have not been established. For example, in anticipation of ASEAN Open Skies, annual growth forecasts and the capacity of airspace and airports should be determined at the outset. It should also be determined what changes need to be made, how these changes should be implemented, and when the changes should be made.

To ensure that someone is fully trained and has sufficient field skills to function successfully as an air traffic controller requires a minimum of three years of constant practice. This issue should always be a consideration in the recruitment of human resources.

To project exactly how many air traffic controllers will be needed over the next three years, pertinent data must be collected. DGCA must then adjust its recruitment, education and training policies, and provide the necessary educational facilities, including securing instructors who have sufficient appropriate field experience. Worker morale is also important. Proposed changes to the structure of ATM will affect employees, and this should not be overlooked.

Infrastructure

The provision of infrastructure always attracts great interest and it is easy to focus on the capability to provide facilities. However, it is important to keep in mind that facility development must be preceded by the creation of appropriate policies and operational concepts.

Broadly speaking, the infrastructure for ATM service in Indonesia is obsolete, both in terms of technology and operational needs. Jakarta's Air Traffic Service system is completely obsolete, and the Makassar Air Traffic Service system is becoming obsolete.

Secondary Surveillance Radar (SSR) technology has been, and continues to be, constructed in the Ujung Pandang FIR, and one unit is installed in the Jakarta FIR. In actuality, this is not all that is required. The SSR needs to be supplemented by a comprehensive operational concept on how these surveillance capabilities may be utilised in the provision of ATM services.

In the DGCA Blueprint for the period 2005–2009, a trial of Automatic Dependent Surveillance/Broadcast (ADS/B) technology was conducted. The 2010–2015 period calls for utilisation of ADS/B in terminal control areas where flight traffic is low, but there has been no further implementation. (For an introduction to ADS/B technology, see "Aviation Infrastructure: A Look to the Future" on page 13 of this issue.)

It would be advantageous for DGCA to review the utilisation of ADS/B technology within the framework of ATM service, by taking note of ICAO recommendations and observing the preparatory steps that have been undertaken by neighbouring countries such as Singapore and Australia. The combined utilisation of radar and ADS/B may increase air space capacity, which is definitely required within the framework of the ASEAN Open Skies implementation and thereafter.

Provision of ATM infrastructure should at all times refer to Amendment 1 of the 15th edition of

ICAO and other technical guidelines.

Towards ASEAN Open Skies

Implementation of Open Skies is only three years away, and it is certain that the amount of airline traffic in Indonesia's airspace will gradually increase, particularly at its five major airports. If serious efforts are not undertaken, use of airspace and airports will soon exceed capacity, and eventually cause an increase in ground and airspace delays, disrupting smooth and efficient flight operations.

Indonesia can successfully prepare for Open Skies by keeping in mind these recommendations:

1. DGCA should thoroughly perform its function as a Policy and Regulatory Office.

2. PT Angkasa Pura I and PT Angkasa Pura II should be more focused on flight navigation services (CNS/ATM) in addition to providing airport services.

3. DGCA should immediately develop policies and regulations related to Amendment 1 of the 15th edition of ICAO's PANS-ATM Doc. 4444.

4. All CASR associated with ATM should be reviewed.

5. DGCA, together with all stakeholders in air navigation, should formulate an operations concept which focuses on ATM services.

6. All policies on the provision of current and future human resources working in ATM should be reviewed.

7. All obsolete infrastructure should be replaced immediately, and relatively new surveillance infrastructure utilised in the interest of smooth and efficient flight operations.

Looking at the current state of ATM in Indonesia, it can indeed be said that preparedness to meet Open Skies is still imperfect, but will not become a disaster for the Indonesian transportation industry if all parties heed the necessity of determining objectives and working to achieve better ATM service. ∎

About the author:
ATM Consultant **Novaro Martodihardjo** retired from PT Angkasa Pura II in 2007 after serving as Vice President of Air Traffic Services since 2001. He has 32 years' experience in the field of ATM, beginning his career as an Air Traffic Controller in 1973, as Aerodrome Controller in Kemayoran and Halim P airports. He achieved qualifications as Approach Radar Controller and became an Operational Supervisor in 1977.

Novaro's involvement with Air Traffic Control (ATC) Automation System began when he participated in ATC Automation Training in Luxembourg in 1981. He spent two years as an ATC Radar Instructor at the Civil Aviation Academy in Curug. Aside from working on ATC operations in Cengkareng and Halim airport as a radar approach controller, Novaro was also assigned to the Dynamic Flight Display Team during the first Indonesia Air Show in 1986. He also participated in the FAA National Air Traffic Flow Management training in 1992, and implemented his knowledge of flow management during the Non-Aligned Summit in Jakarta. He has been involved with the Cengkareng airport development project in the field of aeronautical services.

Novaro's knowledge and experiences in ATM automation were expanded by his participation in Aircat-500 training in Mudon, France with the electronic systems company Thales Group. In 1993 he was involved in the Aircat-500 replacement project. He was actively involved in ICAO Air Traffic Management Y2K Compliance as the Indonesia Coordinator from 1998–2000. He participated in the Indonesia–Australia ATS Informal Coordination Meeting from 1976–2006.

Since retirement, Novaro has worked as an ATM consultant with Indonesia ADS/B Implementation Readiness and other projects such as the Civil Aviation Transformation Team, where for the last three months he was involved in the development of Indonesia's ATM Master Plan.

Letters to Prakarsa

Building a Better Busway

As a *Prakarsa* reader and a TransJakarta fan and user, I am curious to know: are there any plans to improve the busway or add more buses? Having lived in Jakarta since 1999, I think it's the best infrastructure project (apart from almost finishing the toll from Bintaro to the airport) that I have seen in Jakarta. It works – however, it is desperately in need of more buses in order to meet the ever-increasing number of passengers travelling on the busway.

—Julie van Laarhoven
Australian Development Scholarships

Editor's response: *That's a good question, of interest to many Jakarta residents and commuters. So we asked for comments from Yoga Adiwinarto, a transportation specialist at the international non-profit organisation Institute for Transportation and Development Policy, which has been providing technical assistance to the design and operation of the TransJakarta Bus Rapid Transit (BRT) system.*

According to Yoga, the TransJakarta BRT system currently has the longest corridor scheme in the world, with over 140 km of dedicated lanes on 10 corridors, serving around 380,000 passengers per day with 530 buses in the system. However, the system itself is already suffering from overcrowding, especially in the peak hour, where most stations are experiencing massive queues and long waiting times.

These problems have two main causes: the insufficient number of buses and the encroachment by private motor vehicles into the dedicated lanes. Many choked intersections also lengthen the time it takes for buses to travel along their routes.

Unless these problems are overcome, putting more buses on the street would not immediately improve the BRT service; it might even cause longer bus queues at the TransJakarta bus stations. Measures to address this include putting in place a traffic light system that favours the TransJakarta buses at intersections, or building an underpass dedicated to the buses. However, this solution requires a significant allocation of funds along with cooperative efforts by many stakeholders, including the Ministry of Public Works and the police. Jakarta does not presently have the resources needed to install this new infrastructure. For now, the city is working to add more services to the network, by procuring around 200 articulated buses over the next two years. The city and the traffic police are also working to keep automobiles and motorcycles from entering the BRT lane by installing preventive barriers. ∎

The Expert View

Question: "What are some of the key initiatives that DGCA is undertaking to move the air transport sector in Indonesia forward? What do you think the impact will be over the next 5–10 years, particularly with respect to strengthening safety in Indonesia's airspace?"

▶ **Edward A. Silooy**
Director of Air Transport, Ministry of Transportation

"The Directorate of Air Transport has stringently overseen the regulations that were developed under Law no. 1/2009 to meet International Civil Aviation Organization (ICAO) standards, ever since they were first issued. We monitor a variety of components that relate to the protection of air transport consumers, including safety, security, and service. We also supervise the rights and obligations of airlines, including issues regarding service, the arrangement of flight time slots, and tariffs. This supervision is performed through 10 airport authorities in 10 regions. Each authority supervises the implementation of the aforementioned regulations. To maintain safety, our Directorate also restricts route permits by diligently observing whether airline companies have fulfilled all required flight safety procedures. Another measure that we strive to attain is OTP (On Time Performance). We have established the IDSC (Indonesian Slot Coordinator) which is an independent unit that organises flight slots over a six-month time horizon. The purpose of this measure is to improve safety, but it also offers environmental and economic benefits. In the next five to ten years, it is believed that the measures taken by the Directorate of Air Transport will have very positive effects. From the political side, greater interconnectivity among regions will shorten distances and improve the unity of the people of Indonesia as a nation. Furthermore, domestic airline companies will be more prepared to face the challenge of the international Open Skies policy, because they will have quality standards equal to that of international airline companies. In relation to passenger safety, of course, we expect the lowest possible accident rate, and this can only be achieved by strict adherence to the regulations in effect."

▶ **Arfiyanti Samad**
Secretary, Directorate General of Civil Aviation, Ministry of Transportation

"Law no. 1/2009 on Air Transportation mandates that air transportation is controlled by the State and is developed by the government, in this case the Directorate General of Civil Aviation (DGCA). Indonesia has been a member of the International Civil Aviation Organization (ICAO) since 1963. Air transport operations in Indonesia follow the ICAO Civil Aviation Safety Regulations and the Standard and Recommended Practices. ICAO periodically conducts an audit to review their implementation.

Among the important initiatives that have been undertaken by the DGCA that are expected to improve air transport safety and increase international confidence are:

• The establishment of the National Air Transport Safety Program (*Program Keselamatan Penerbangan Nasional*) as a means to implement a Safety Management System

• The establishment of the National Air Transport Security Program (*Program Keamanan Penerbangan Nasional*) and the National Air Transport Commission (*Komite Nasional Keamanan Penerbangan*)

• The establishment of the Air Navigation Single Provider and National Air Navigation Order (now being finalised)

• The establishment of 10 Airport Authority offices as an extension of the DGCA for supervising air transport provisions and regulations throughout Indonesia

• The development of international cooperation within the framework of air transport human resources capacity building."

Outcomes:

Public Works Auditors Achieve Qualifications

The Inspectorate General (IG) of the Ministry of Public Works (MPW) is currently implementing a reform agenda that includes the introduction of Risk Based Internal Audit methodologies (RBIA). RBIA helps auditors to maximise their efficiency by identifying high risk areas on which to focus. At the same time, these auditors help managers to improve the effectiveness and efficiency of their infrastructure investments. To assist the IG, the AusAID funded Indonesia Infrastructure Initiative has facilitated a series of capacity-building activities related to using RBIA tools effectively. As part of this, IG staff have participated in coursework to become Qualified Internal Auditors, an internationally recognised accredited professional certification. One hundred staff completed the Basic module, 59 went on to do the Advanced module and 14 went on to successfully complete the Managerial module. Completion of the training prepares staff for additional hands-on training experiences and audits in the field using RBIA methodology. (*Editor's note: this material is excerpted from an IndII "Activity Update". More Activity Updates and Success Stories that describe IndII's activities across a range of sectors can be found under the Publications section of the IndII website, www.indii.co.id*).

In Our Next Issue: Port Development

Indonesia is dedicated to bringing its port system up to international standards within the framework of its National Ports Master Plan (mandated under Shipping Law no. 17/2008). Policy makers are considering how best to meet shipping law requirements, plan port development, and encourage private sector investment. The shipping law calls for private sector investment (and specifically the eradication of monopolies), but roadblocks such as the so-called "Negative Investment List" and other factors act to dissuade both global and domestic interest in port investments. Port labour reform and human resource development offer additional challenges. The April 2012 edition of *Prakarsa* will examine how Indonesia is instituting best practices and making progress in confronting issues such as these.