



الهيئة العامة للطيران المدني
General Authority of Civil Aviation

A Bimonthly Magazine Published by the
General Authority of the Civil Aviation, Kingdom of Saudi Arabia

CIVIL AVIATION

Issue 68, January 2012, Safar 1433



Beijing hopes for double impact

بطن لغلاف الانجليزي

إعلان (شرك قبُعدلات سالات لساكية ةول لساكية ة)

يؤخ ذ من لعدد رقم ٦٣

GACA: Continuity and a New Look

With the issuance of the royal decree in the fifth of last November reforming and the General Authority for Civil Aviation (GACA) and reorganizing its basic structure, GACA is set to take a long step towards more growth and stability. Furthermore, by reporting directly to the Chairman of the Council of Ministers, GACA has gained more independence and tremendous momentum to pace confidently and smoothly to develop the aviation industry in the Kingdom, as it is considered to be a fundamental engine of economic growth attracting capital, and employing tens of thousands of manpower directly and indirectly, in addition to its involvement in the development of rural and urban areas which enjoys its vital services.

To prove this effectiveness, here is a simple example showing the contribution by the aviation industry in a medium size economy which is considered as lagging far behind within the macro economy of Kingdom of Saudi Arabia. Lately, the State of Pennsylvania (USA) issued the state's annual report about the impact of the aviation industry on the state's economy. This is a state, with an area not exceeding (45,000 square miles) compared to the area of the kingdom of Saudi Arabia of (760,000 square miles) and a population of 13 million compared to the population of the Kingdom of 28 millions. Pennsylvania state hosts 15 commercial airports (three of which are international) which directly and indirectly employ over 305 thousand people, and annually pays over 9 billion US Dollars in wages and salaries while generating about 24 billion US Dollars annually for the state's economy, gained by various business activities linked with the aviation industry.

It is then evident that the aviation industry in the Kingdom can provide much more. Thus, more is expected from GACA, and more to be accomplished. And GACA is hoping to meet all these expectations. All that lies within the priorities of the GACA, knowing that all resources are at its disposal, crowned by the unlimited and sincere support and appreciation of this country wise leadership. In view of the responsibilities entrusted on us, we are incumbent to shoulder these responsibilities diligently in order to be

up to deliver our best in serving our country, our citizens, residents and visitors as well.

To realize this farsighted vision, GACA has been striving hard to unify its efforts and concentrate its activities to develop this vital industry through various avenues. On the top of which is the transformation of airports to commercial units governed by the market potentials and controlled by supply and demand, as the case at all international airports globally. In order to reap the benefits of a successful privatization projects, GACA has long worked on qualifying its human resources, improving performance, to fulfill all that is needed for the intended transformation, legally and commercially. At the same time, GACA has extended the hands of cooperation to the private sector in order to join in the exchange of benefits towards realization of the common welfare and improve the levels and quality of performance.

No doubt the General Authority for Civil Aviation is a very important and influential entity. However, the anticipation is to expand the range of its influence to serve our national economy.

Today, we are set to start a new calendar year, as we just did in receiving a new hejira year. But sadly we have left behind a mournful year, where we had lost an unmatched leader, a benevolent prince and a wise patron for the aviation industry in our country, Prince Sultan bin Abdul Aziz may Allah bestow him his mercy on him.

Therefore, we must oblige ourselves to continue the journey following the wise path set by our late prince, and where he repeatedly called on us to advance with this vital domain. Therefore no doubt that we shall remain on our commitment toward our wise and conscious leadership, May Allah save our well-beloved King Abdullah bin Abdul Aziz, and his faithful crown prince, may Allah keep both in good health.

Finally, I would like to welcome the arrival of HH Prince Fahd bin Abdullah, the President of the General Authority for the Civil Aviation, wishing GACA the best to achieve further success under the patronage of his leadership.

* VP, General Authority for Civil Aviation



المدينة العامة للطيران المدني
General Authority of Civil Aviation

A Quarterly Magazine Published by the
the General Authority of Civil Aviation,
Kingdom of Saudi Arabia

CIVIL AVIATION

Issue 68, January 2012, Safar 1433

Presiding Editor

President of GACA

Assistant Presiding Editor

VP, GACA

Editor-in-Chief

Dr. Salem A. Sahab

Advisory Board

Dr. Moqbel Saleh Al Zakeer
Dr. Mohamed A. Al Amin
Dr. Mohsen Al-Naggar
Dr. Ali H. Al-Zahrani
Prof. Ali M. Al-bahi



Edited & Designed by
Fikra, Media &
Marketing Consultants
P.O.Box 8004
Jeddah, 21482
Saudi Arabia
Tel: 665-6669, 661-2601
Fax: 665-4719
E-mail: info@efikra.com
Web: www.efikra.com

مركز الطيران المدني العام للسعودية الرياض

8



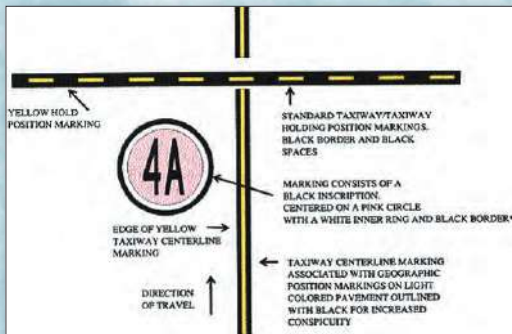
Jeddah Airport Upgrade '90% Complete'

10

Hail SESAR: the rise of remote tower



12



Airport Taxiways

Challenges of Helicopter Rotor Tracking and Balancing (RTB)

14



Beijing hopes for double impact

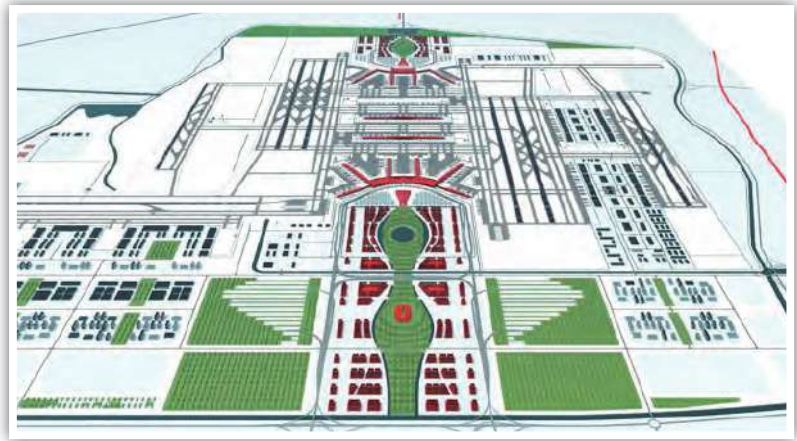
Plans are in hand to develop a second airport for the Chinese capital

The new high-speed railway line linking Beijing with Shanghai has caught the public imagination in China, but the central and municipal authorities in the Chinese capital are still proceeding with plans for a second airport. Beijing Capital International Airport (BCIA) ranked second worldwide in passenger through-put in 2010, with 73 million users moving through the airport. Given BCIA had targeted to hit 80 million passengers a year in 2015, adding capacity will be vital to sustain a thriving local economy.

While the Civil Aviation Administration of China (CAAC) has signaled that the New Beijing International Airport (NBIA) would be ready by 2017 in the southern suburb of Daxing. Further details remain opaque as the CAAC waits for the National Development and Reform Commission (NDRC), which formulates government policy to issue final approval for construction.

Funding for the new airport has already been earmarked. The Beijing municipal government quietly announced it was putting up the cash in early 2011, when the Beijing Youth Daily communist party newspaper reported that CNY76.6 billion (USD12 billion) had been earmarked for 109 infrastructure projects in 2011, among them “an airport”.

In July NACO, a Dutch airport planning company, was chosen by the CAAC as master plan designer



By MARK GODFREY

for NBIA. Chief Executive Officer Rik Krabbendam described the award as “a milestone”, adding: “This size of airport never has been planned before.”

He expects that the ‘point-to-point’ traffic character of the airport, with low transfer traffic, will result in more annual aircraft movements than Atlanta Hartsfield, currently the busiest airport in the world by passenger volume. “The landside traffic demand, however, will be three times of what Atlanta is facing,” Krabbendam said. Therefore, the biggest challenge for the design team was to channel those enormous flows of passengers and employees from and to the airport over different modes of transport in such a way that the airport remains accessible at any time.

Other bidders for the NBIA master plan design included US-based Landrum & Brown (L&B), which,

with Boeing subsidiary Jeppesen, conducted research into runway layout and simulation analysis for a Beijing new airport runway alignment project.

This project was conducted by the US-China Cooperation Programme (ACP) with the CAAC’s internal design institute. The 10-month project was hosted by the Beijing Second Airport Construction headquarters at the CAAC and findings were presented to CAAC Airport Department Deputy director general, Wang Chang Yi, according to the ACP.

Two-airport model

Local aviation experts see a new terminal as vital. Liu Wengui, head of aviation consultancy Kent Ridge, says Beijing will be mirroring a two-airport model already used by Shanghai as well as Tokyo.

“If demand continues at its current pace the existing airport will

be processing 122 million passengers in 2015, which is not sustainable,” Liu remarked. Kent Ridge, which conducted research for BCIA on the distribution of traffic among London’s airports, envisages a mix of traffic at the new airport comprising “domestic, regional and low-fare airlines”.

China United’s Yao also reported that the new airport will start with a capacity of 40 million passengers a year and space to expand to an eventual 80 million passengers, matching BCIA. This could be good news to foreign carriers seeking to expand capacity at Beijing, including Middle Eastern airlines such as Qatar Airways, which service the growing China-Africa market.

Another international airline lining up for more Beijing slots is Sri Lankan, which is seeking to add to the three flights a week it has operated out of Beijing since 2005. Currently the airport is too congested, said Mayoni De Silva, acting manager for north and east China at the airline. He added that the carrier operates with 85 per cent capacity on its Beijing flights due to a surge in Chinese tourism to the Maldives. The airline needs any new slot to line up with its connection to Bangkok, said De Silva, but getting more capacity on the Beijing route is a priority. He added: “China is the place for us right now.”

On the cargo side there is clear demand for more slots: United Arab Emirates-based Etihad Airlines reported 89 per cent loads on cargo operations between Beijing and Abu Dhabi in 2010, which was largely a result of surging Chinese investment in Africa. Seek-

KEY FACTS AND FIGURES FOR BEIJING NEW INTERNATIONAL AIRPORT

Initial annual capacity: 50 million passenger movements, 500,000 annual aircraft movements
Ultimate annual capacity: 130 million passenger movements (including 30 million transfers), 1 million aircraft movements
Average daily passenger volume: 350,000 (approx)
Traffic mix: 75 per cent domestic, 25 per cent international
Annual cargo volume: 3.2 million tonnes
Runways: 8 in total (6 North-South, 2 East-West)
Aircraft stands: 370 (75 per cent Code C, 25 per cent Code E/F)

ing increased capacity on the Beijing routes is a priority for Etihad, Chief Executive Officer James Hogan told Chinese media recently.

Aggressive competition

Freight carriers welcome any new capacity for Beijing, which acts as a hub for north Chinese electronics and IT industrial clusters as well as the region’s thriving automotive sector. According to Paul Lim, president of Supply China Asia, an umbrella body for logistics industry: “With the growth rate projected by these industries, the additional cargo space to come around 2017 would be a relief rather than a burden.” Another factor is Beijing’s need to benchmark itself with Shanghai. “The two cities compete aggressively almost as if they are two different countries – instead of provinces within one country,” Lim said.

Foreign contractors did well from the flagship BCIA Terminal 3: notably Foster + Partners and Arup in design and structural engineering, and Goldhofer and Cobus in supplying airside vehicles. A recent surge in interest in airport contracts among Chinese contractors - China Airport Construction Co and China Commu-

nications Construction Co in particular - will not trouble foreign players who remain in the best position to compete for the high-value work. “Chinese architecture and project planning capabilities remain weak in the context of the international marketplace,” said Ni Lu, head of the Beijing office of aviation consultancy Garfinkle & Wang.

It is hard to decipher the precise need for a new airport given the way in which Beijing manages its airspace and slots. Users of BCIA complain that the futuristic T3 often requires domestic passengers to be bussed into the arrivals hall. That may be a sign of bad management or a lack of capacity. To reduce congestion the EU and US chambers of commerce in China have requested that the government opens up its airspace, which remains 80 per cent controlled by the military. International airlines also complain that airport charges and jet fuel costs are punitive to foreign carriers. Restrictions on booking passengers and luggage from regional airports on for international flights routed through Beijing also cast doubts on BCIA’s stated goal of becoming a hub for north Asia ■

Source: Jane’s Airport Review

KAIA Airside Upgrade is 90% Complete

Projects to upgrade and modernize the airside infrastructure in King Abdul Aziz International Airport (KAIA) is 90% complete, said Eng. Muhammad Abed, the general supervisor of KAIA's Development Project.

"Runways, courses and courtyards have been built to accommodate the new giant airplanes," said Abed. These parts of the project will be completed by the mid 2012, he added.

Abed was briefing Prince Fahd Bin Abdullah, President of the General Authority of Civil Aviation (GACA), during the latter's visit to the site. He also said that 60% of engineering design work has been completed.

"Work at the aviation, aviation safety standards and monitoring buildings has been completed. A total of 69% of excavation work has been finished as well. The project will be finished by the end of next September."

Prince Fahd said that work hours and shifts



should be increased to ensure the completion of the project on time. He added: this new project will enhance the airport's role as a gateway to the two Holy Mosques and as a link between east and west. He also said that passengers will soon have world-class services at the airport; and that similar plans are underway to upgrade the Kingdom's other airports.

Sukuk is to Fund KAIA \$7.2 Billion New Airport;

Head of the General Authority of Civil Aviation in Saudi Arabia, Prince Fahd bin Abdullah bin Mohammed al-Saud, said the kingdom will see the separation of the civil aviation from the ministry of defense. Sukuk will fund the new \$7.2 billion airport project that is expected to launch in Jeddah within two months, despite a four-week delay of works related to the project, head of the General Authority of Civil Aviation (GACA) in Saudi Arabia, Prince Fahd bin Abdullah al-Saud, told Al Arabiya TV.

"We have agreed with the finance ministry and the Saudi Arabian Monetary Agency to launch sukuk," Prince Fahd bin said, adding, "the [\$7.2 billion] will be self-financing instruments of the Civil Aviation Authority, but if there is any shortage in the funding, the ministry of finance

will cover it to curtail any delays in the project."

Plans are also in place to transfer GACA to a stock-holding company, he said, and it will constitute four companies, specializing in four departments including international airports, domestic airports, air navigation, technology transfer and information.

All these four companies will be open for a general IPO and from a year from now, he said.

When asked whether foreign companies could enter the domestic transport sector in the kingdom, he said only Saudi companies are allowed to do so as it is a sovereignty issue.

Saudi Arabia is also expected to separate its civil aviation from the ministry of defense in the next three

months after a royal decree ordered the split, he said.

"No doubt [separating the two] will give greater flexibility to civil aviation and enable it to make its own decisions. But in the same time, there will still be cooperation between the ministry of defense and the civil aviation due to the commonality of issues."

He added that there are committees working almost every day to work on the procedures to finalize the process.

The aviation sector can be an important pillar for the Saudi economy, and can come third or even second after the oil sector, he said, despite challenges such as enhancing the aviation authorities' system. According to him, the aviation sector is able to double employment in the kingdom.

India's Airports: 120 Million Passengers in 2009/10

India's airports handled more than 120 million passengers in 2009/10, and thanks to strong gross domestic product growth, a young population and a growing middle class, the market is set to be one of the fastest growing over the next 20 years. The country's airport infrastructure has already seen considerable development over the last few years, with the Airports Authority of India investing US\$265 million in modernisation projects alone last year. A further 14 Greenfield airports have been approved, while modernisation programmes are planned at airports including Guwahati, Mumbai and Tirupati.

In June, Bengaluru International Airport (formerly Bangalore) started construction work on the expansion of its Terminal One.



Bengaluru International Airport opened in May 2008 and has experienced a growth rate of 18% per annum in its first three years of operations, making it, according to the airport's management team, one of the fastest growing hubs in the country. Last year Bengaluru handled 11.7 million passengers and 224,000 metric tons of cargo – up 24.6% on the previous year.

The expanded terminal, which is due for completion in 18 months, will double the existing terminal

area of 753,500 sq ft (70,000m²) and will boost annual terminal capacity to over 17 million passengers, with the flexibility to increase to 20 million when required.

In February, the new international terminal was opened at Thiruvananthapuram Airport in southern India. The 346,609 sq ft (32,200m²) terminal has a peak hour passenger handling capacity of 1,600.

A modernised and expanded Chennai Airport is expected to be completed by the end of this year, including a new domestic terminal and expanded international terminal, allowing the airport to handle 40 aircraft movements an hour compared with 30 currently and an annual passenger throughput of 27.6 million by 2020.

Source: Airports International

Cathay Pacific Profit Down

Figures can be deceiving. Cathay Pacific Airways announced an interim profit of HK\$2.8 billion (US\$358.97 million) last August, a 58.9% fall on the 2010 mid-term figures.

Chairman Chris Pratt put the performance into perspective. "I don't think anybody realistically expected a repeat of last year's phenomenal performance. I would suggest that [the 2011 results] reflect a return to what I might call a standard Cathay Pacific year in which business is generally stronger in the second half than it is in the first," he said.

In fact, in the airline's newsletter, CX World, chief executive, John Slosar, put the result [to June 30] into even more perspective. "Out-

side of 2010 this was our best interim result in 10 years," he wrote.

The price of fuel proved Cathay's biggest enemy in the six-month period. Fuel costs rose HK\$6.46 billion or 49.5% to HK\$18.56 billion. However, its hedging policy proved successful and resulted in a HK\$962 million profit for the carrier.

Turnover increased 13.2% to HK\$46.8 billion. The passenger business of Cathay and wholly-owned subsidiary, Dragonair, performed well with strong demand for premium class travel. The exception was Japan, where the March 11 earthquake and tsunami had a telling effect on one of Cathay's strongest routes.

Across the carriers, passenger

revenue rose 15.9% to HK\$31.77 billion. The two airlines carried 13.2 million passengers in the interim period, an increase of 1.7% on 2010. Capacity increased 9.8%. While the load factor fell 4.7 percentage points, yield increased 11.8%.

Cargo revenue weakened appreciably in the second quarter, particularly out of the carriers' two most important markets, Hong Kong and China. Revenue was up 7.7%, to HK\$11.63 billion compared with 2010. Yield was up 7.1%

Capacity in the period rose 14.6%. Load factor declined 9.6 percentage points.

Source: Orient aviation

Hail SESAR: the rise of remote tower

Work to develop remote and virtual towers is well advanced in Europe as the Single European Sky ATM Research (SESAR) programme seeks to deliver improved operational efficiency and lower air traffic control costs.

Systems such as the Remotely Operated Tower (ROT) developed by Saab and LFV (air navigation service provider) in Sweden, and the Distant Aerodrome Control Service (DACS) from DFS in Germany, could in turn represent a step towards highly automated air traffic management (ATM) at airports.

Advocates of remote towers argue that considerable cost savings can be made, as they remove the need to construct or maintain control towers at airports with little traffic. Enabling multiple airports to be monitored from a central location also allows more efficient use of the controller workforce. Also the direct control of technology from the remote tower centre means that fewer ATM systems need to be maintained at the local airport.

Among its stated high-level objectives, SESAR is aiming to develop requirements to remotely operate in real time ATC services in faraway or secluded airports without a control tow-



A sight soon to vanish? New Technology could render the out-of-the-window view redundant.

er; provide major hub airports with a “synthetic augmentation of vision for local operations” in order to increase situational awareness during poor-visibility conditions and at night; provide contingency facilities at large airports; and “develop the operative concept for a remote/virtual tower”.

SESAR validation activities of remote towers are scheduled for 2012-15 in Norway and Sweden. These projects will assess the designed system, controller working position and operational methods. In particular, they will validate the situational awareness for tower controllers and the operational service level impacts by introducing visual enhancement and target tracking functions in a remote tower environment.

Saab of Sweden is working with air navigation service provider LFV to market the ROT. Live testing has already been completed in Sweden and a contract has been signed to provide remote tower services at two Swedish airports (Ornskoldsvik and Sundsvall) from one central location.

The concept relies on high-definition cameras featuring an automatic tracking capability with 36x zoom, in addition to conventional navigational aids, to replicate a conventional tower in an environment remote from the airfield. Data is projected in a 360-degree view.

The customer can select the level of required surveillance, along with such data as weath-

er, runway visual range and airfield lighting status, to be displayed to the controller. As a recent enhancement, Saab has started to combine camera data with radar returns to test the tracking capability of the video technology.

Aside from the ROT's connection with SESAR, remotely operated air traffic control tower technology is to be trialled in Australia, following an agreement between Saab and Airservices Australia.

Australian trials

During the trial, set to begin later in 2011, Airservices staff will manage aircraft at Alice Springs from a control tower 1,500 km away in Adelaide. Following the trial, Airservices will consider introducing the technology at a number of airports across Australia, in particular, those where traffic is increasing but have no towers.

“Due to the cost of primary and back-up data communications in Australia, it is estimated that the initial operating costs of a remote tower are roughly the same as a traditional tower to start with, but reducing over time,” as stated by the acting general manager for air traffic control at Airservices Australia.

He added that backing up critical data in the event of an outage is a challenging task for

instance, an alternative fibre-optic route “involves a transmission distance of around 7,000 km”. While the LFV expects to certify a facility in

northern Sweden for ROT operations by the end of 2011, its German counterpart DFS received a remote tower procedure certificate for its DACS system from the Federal National Supervisory Authority for Air Navigation Services (BAF) as long ago as 2007.

DFS envisages that its remote tower technology could act as a gap-filling additional sensor in a large, complex hub airport, supplementing information from primary radar and multilateration - for 10 per cent of the cost of primary radar.

DACS provides controllers with systems and instrument information and the option for complementary visual data about the situation on the ground. Giving controllers the option to follow visual or instrument procedures could deliver radical change if adopted by the controller community, yet it is a logical step to take, argued the head of tower systems at DFS:

Instrument data is derived from a specialized data system, which provides controllers with the air and ground picture. Information on weather, flight plans and

surveillance is provided to the controller while reviewing the traffic situation. The sensor technology allows the controller to switch from the air to the ground situation. The ground display shows runways, buildings and the lighting system in detail; this is intended to boost controller situational awareness, leading in turn to improved safety, fewer low-visibility procedures, increased capacity and better punctuality.

To provide visual data, DFS uses video sensor technology. The video sensor offers tower controllers a view of the airfield and a way to automatically identify and locate ground movements. DFS says it has successfully demonstrated that this technology fulfils the international requirements for an A-SMGCS non-cooperative sensor.

After trials at Munich, Cologne and Erfurt, DFS is setting up its Distant Aerodrome Control Service for live operational deployment. “At Erfurt, DFS and the German Aerospace Centre [DLR] are still in the process of pre-operational trials, [and] on a national basis DFS has regular meetings with the union for full operational approval – thus, the Distant Aerodrome Control Service will be ready for operations beginning of 2013

SOURCE: Jane's AIRPORT Review

Airport Taxiways

Runways are well known and quite popular even to those who have no thorough knowledge of aviation. Simply by being a traveler you might have developed some knowledge enough for you to claim that you know these landing and departing strips.

In this article, and without knowing the importance of taxiways, you will realize how humble your knowledge about runways and that you only know the simplest and more straight forward aviation-related unit

Taxiways are those pavements that have centreline markings and runway holding position markings whenever they intersect a runway. Taxiway edge markings are present whenever there is a need to separate the taxiway from a pavement that is not intended for aircraft use or to delineate the edge of the taxiway. Taxiways may also have shoulder markings and holding position markings for Instrument Landing System critical areas, and taxiway/taxiway intersection markings.

The taxiway centreline is a single continuous yellow line, 15 cm to 30 cm in width. This provides a visual cue to permit taxiing along a designated path. Ideally the aircraft should be kept centered over this line during taxi to ensure wing-tip clearance.



**By Dr. Mohamed
Elfatih Elamin***

Taxiway Edge Markings.

Taxiway edge markings are used to define the edge of the taxiway. They are primarily used when the taxiway edge does not correspond with the edge of the pavement. There are two types of markings depending upon whether the aircraft is suppose to cross the taxiway edge:

1. Continuous Markings.

These consist of a continuous double yellow line, with each line being at least 15 cm in width spaced 15 cm apart. They are used to define the taxiway edge from the shoulder or some other adjacent paved surface not intended for use by aircraft.

2. Dashed Markings.

These markings are used when there is an operational need to define the edge of a taxiway or taxi-lane

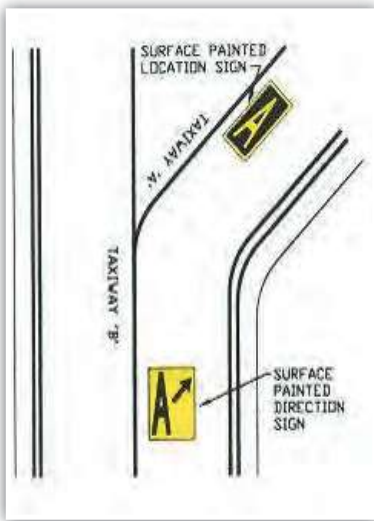
on a paved surface where the adjoining pavement to the taxiway edge is intended for use by aircraft. e.g., an apron. Dashed taxiway edge markings consist of a broken double yellow line, with each line being at least 15 cm in width, spaced 15 cm apart (edge to edge). These lines are 4.5 meters in length with 7.5 meters gaps.

Taxi Shoulder Markings.

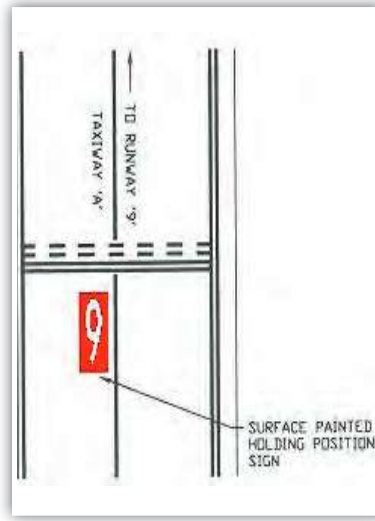
Taxiways, holding bays, and aprons are sometimes provided with paved shoulders to prevent blast and water erosion. Although shoulders may have the appearance of full strength unable to support an aircraft. Usually the taxiway edge marking will define this area. Where conditions exist such as islands or taxiway curves that may cause confusion as to which side of the edge stripe is for use by aircraft, taxiway shoulder markings may be used to indicate the pavement is unusable. Taxiway shoulder markings are yellow.

Surface Painted Taxiway Direction Signs.

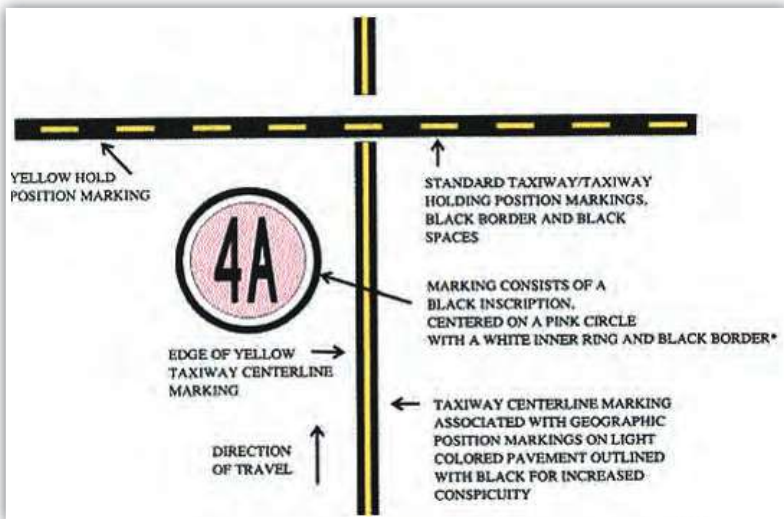
Surface painted taxiway direction signs have a yellow background with a black inscription, and are provided when it is not possible to pro-



Surface Painted Taxiway Direction Signs



Surface Painted Location Signs



Geographic Position Markings

vide taxiway direction signs at intersections, or when necessary to supplement such signs. These markings are located adjacent to the centreline with signs indicating turns to the left being on the left side of the taxiway centreline and signs indicating turns to the right being on the right side of the centreline.

Surface Painted Location Signs.

Surface painted location signs have a black background with a yellow inscription. When necessary, these markings are used to supplement location signs located along side the taxiway and assist the pilot in confirming the designation of the taxiway on which the aircraft is located. These mark-

ings are located on the right side of the centreline.

The most important rule to remember is that any sign that has white letters on red is mandatory. Usually they mark points that must not be passed without permission from air traffic control.

Geographic Position Markings.

These markings are located at points along low visibility taxi routes designated in the airport's Surface Movement Guidance Control System (SMGCS) plan. They are used to identify the location of taxiing aircraft during low visibility operations. Low visibility operations are those that occur when the runway visible range (RVR) is below 360 meters. They are positioned to the left of the taxiway centreline in the direction of taxiing. The geographic position marking is a circle comprised of an outer black ring contiguous to a white ring with a pink circle in the middle. When installed on asphalt or other dark-colored pavements, the white ring and the black ring are reversed, i.e., the white ring becomes the outer ring and the black ring becomes the inner ring. It is designated with either a number or a number and letter. The number corresponds to the consecutive position of the marking on the route ■

... To be continued

* Technical Advisor of GACA Civil Aviation's Communications Air Navigation Services

Challenges of Helicopter Rotor Tracking and Balancing (RTB)

Helicopter rotor track and balance (RTB) is a routine maintenance procedure carried out on helicopter main rotor and tail rotor blades. However, significant time being spent on this item could lead to significant amount of money being spent. The reason RTB is regularly being carried out on helicopters is because the imbalance of lift generated by the main and tail rotor blades and progressive blades wear could lead to significant lateral and vertical vibration as well as a high main rotors track split (track split being the height between the highest and lowest blades measured by an onboard camera). Usually the original equipment manufacturer (OEM) sets a limit on these vibrations and track split that should not be exceeded otherwise components damage could occur in the helicopter as well as an increase human fatigue due to vibrations. So if these limits are exceeded then RTB maintenance is required.

There are many companies that provide dedicated systems for RTB but with slightly different approaches. The process of RTB requires reading vibration and track split values at various flight levels (e.g. ground, hovering, forward speed) while flying the helicopter under a dedicated RTB flight mission. Maintenance engineers on the ground input data to RTB systems which works out the required



Sikorsky S-76D



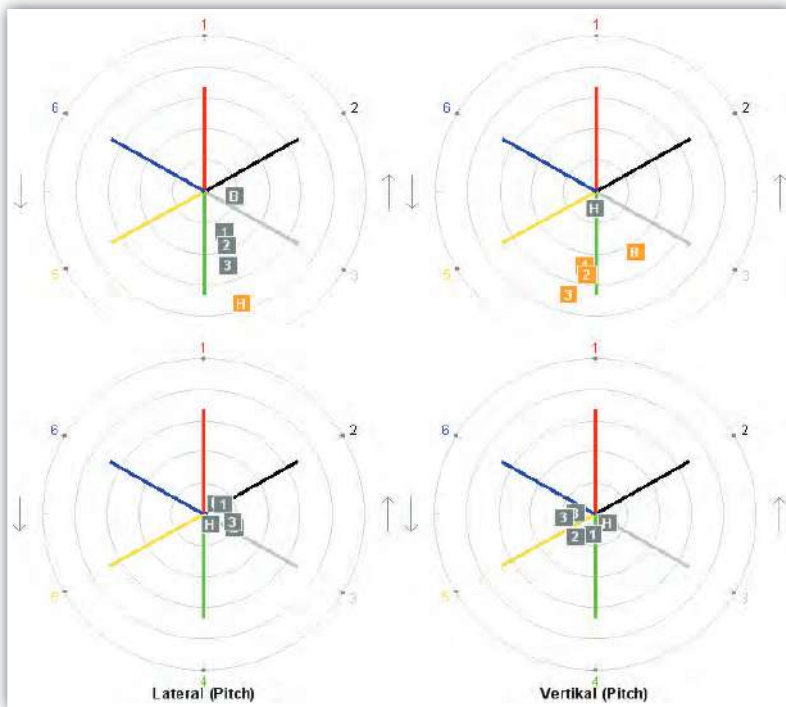
**By Dr Mostafa
Burchak***

blades pitch, tabs and weight adjustments to reduce vibration and track split to within OEM limits. After these corrections are applied the helicopter is flown again to verify the solution. If successful then RTB mission accomplished otherwise maintenance engineers have start all over again.

New Technologies

Over the years, RTB systems

providers concentrated the majority of their efforts in developing robust algorithm for working out RTB solutions. To explain how the algorithm works, consider an increment of adjustment being done on the pitch rod. This will lead to certain values in lateral, vertical and track split. These changes could be to the better or the worse. However, the algorithm applies these theoretically over many iterations using all the adjustments possible on all the blades but with independent calculations for main and tail rotors. For mathematicians, the problem is an optimization one and has therefore approximate and many possible solutions. Consequently, RTB developers reached a saturation point in terms of algorithm development. Hence, recent efforts have been directed towards more intelligent designs such as



Lateral and vertical vibration before (top) and after RTB adjustments (bottom). Grey color indicating vibration within OEM recommended limits. B: ground, H: hover, 1, 2 and 3 represent forward speed 1, 2 and 3 respectively



NASA have been recently experimenting in-flight blade control using large scale wind tunnel.

in-flight blades control and active tabs control as seen in the figures below.

Other potential technologies that could see its way to helicopter rotor blades are morphing wings. Researchers are using shape morphing technologies to adjust the

leading and trailing edges of potentially helicopter blades in flight using in what is termed “Adaptive Compliant Wing”. However, these technologies are at early stages of design and have to overcome many issues such as control and safety matters before becoming



Rotortuner 2000 developed by Helitune Ltd (where the author worked previously)



New helicopter designs will see the use of active control tabs

certified for helicopter use.

More RTB Challenges!

One other remaining challenge in RTB though is a system that can effectively smooth out vibrations due to rotor blades in a Tandem Rotor helicopter such as the Boeing CH-47 Chinook. Boeing in specific and other RTB providers in general have yet to produce RTB algorithm that can yield comprehensive solutions for Tandem rotor helicopters. But with the introduction in-flight blade control, active control tabs and morphing blades leading/trailing edges this could all change to the better ■

* Department of Aeronautical Engineering - King Abdulaziz University

World's Largest Airlines 2010

Ranked by Scheduled Passengers Carried

Rank	Airline	2010	2009	2008	2007	2006
1	Delta Air Lines ¹	162,614,714	161,049,000	106,070,000	72,900,000	73,584,000
2	United Airlines ²	145,550,000	81,421,000	86,412,000	68,400,000	69,265,000
3	Southwest Airlines ³	130,948,747	101,339,000	101,921,000	101,911,000	96,277,000
4	American Airlines	105,163,576	85,719,000	92,772,000	98,162,000	99,835,000
5	Lufthansa ⁴	90,173,000	76,543,000	70,543,000	66,100,000	53,400,000
6	China Southern Airlines	76,500,000	66,280,000	57,961,000	56,900,000	48,512,000
7	Ryanair ⁵	71,250,000	-	-	-	-
8	Air France-KLM	70,750,000	71,394,000	73,844,000	74,795,000	73,484,000
9	China Eastern Airlines	64,877,800	44,042,990	37,231,480	39,161,400	35,039,700
10	US Airways	59,809,367	58,921,521	62,659,842	66,056,374	66,102,774

1. Includes Northwest Airlines from 2008
2. Includes Continental Airlines from 2010; currently largest carrier in the world
3. Includes AirTran Airways
4. Includes Swiss International Air Lines from 2007, Austrian Airlines and bmi from 2009
5. Ryanair number based on actual tickets sold

Ranked by Scheduled International Passenger - kilometers Flown

Rank	Airline	2010	2009	2008
1	Emirates	143,660	118,284	100,672
2	Lufthansa ¹	124,614	118,264	
3	Delta Air Lines	119,055	70,725	
4	Air France ²	115,837	116,711	
5	British Airways	103,095	109,402	113,075
6	Cathay Pacific ³	87,332	81,086	83,542
7	Singapore Airlines ⁴	84,911	81,552	93,626
8	Ryanair	81,890		
9	American Airlines	80,531	76,301	80,809
10	KLM	73,472	71,972	

1. Excludes figures for Swiss International Air Lines and Germanwings
2. Excludes figures for KLM
3. Excludes figures for SilkAir
4. Excludes figures for Dragonair

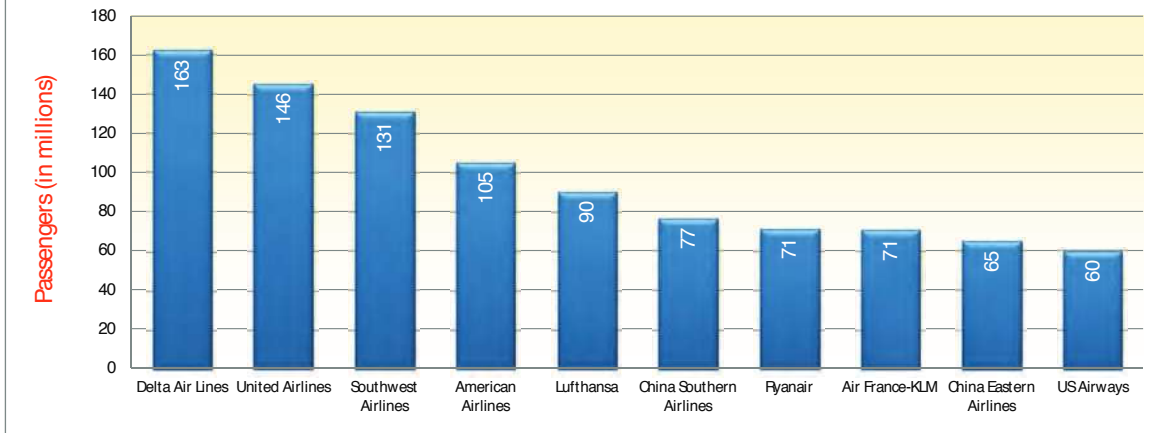
Ranked by Scheduled Freight Tonne - kilometres Flown

Rank	Airline	2010	2009	2008	2007	2006
1	FedEx Express	15,743	13,756	26,122	19,710	16,145
2	UPS Airlines	10,194	9,189	16,977	13,968	9,941
3	Cathay Pacific ¹	9,587	7,722	8,245	8,225	6,914
4	Korean Air ¹	9,542	8,284	8,890	9,568	8,764
5	Emirates ¹	7,913	6,369	5,313	5,497	-
6	Lufthansa ¹	7,423	6,668	8,206	8,348	8,091
7	Singapore Airlines Cargo ¹	7,001	6,455	7,486	7,945	7,991
8	China Airlines	6,410	4,903	5,261	6,301	6,099
9	Cargolux	5,166	4,652	6,334	5,482	5,237
10	EVA Air	4,901				

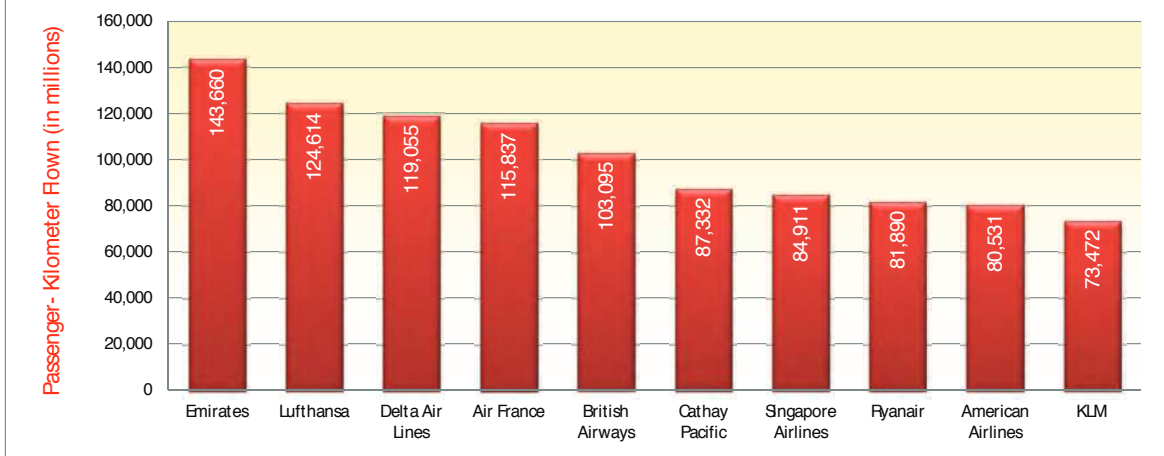
1. Excludes figures for flights to Hong Kong and Macau from the rest of the People's Republic of China

Source: IATA

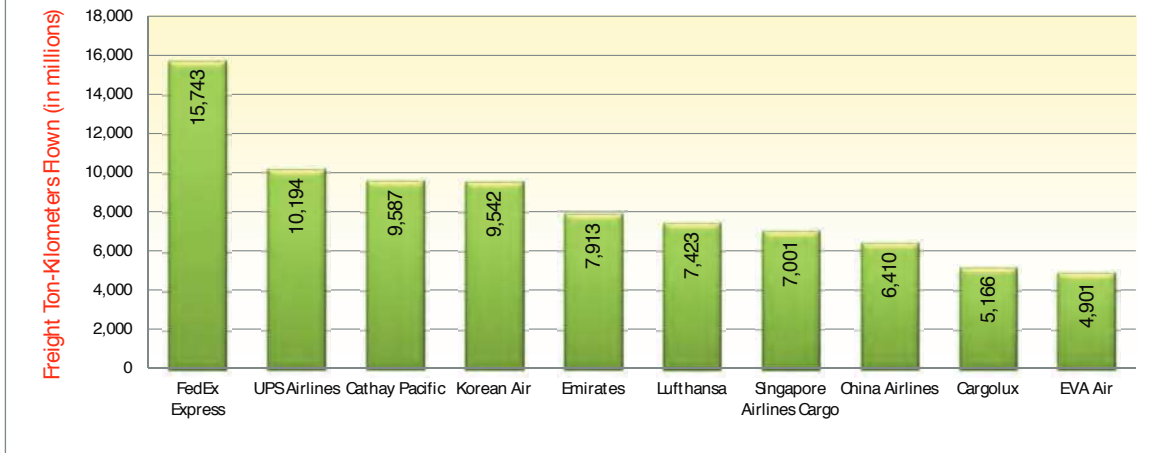
World's Largest Airlines 2010 by Scheduled Passengers Carried



World's Largest Airlines 2010 By Scheduled International Passenger-Kilometer Flown



World's Largest Airlines 2010 By Scheduled Freight Ton-Kilometers flown



Forthcoming Aviation Conferences, Exhibitions & Seminars

1 January – 29 February 2012

8 - 12 January

26th Annual Aviation Issues Conference
 Kohala Coast, HI, USA
<http://events.aaae.org/sites/120101/index.cfm>

11 - 12 January

ICAO Regional Aviation Security Conference
 Kuala Lumpur, Malaysia
<http://www2.icao.int/en/>

11 - 13 January

Airport Risk Management Conference
 New Orleans, LA, USA
aci-na.org/event/552

12 - 14 January

6th ACI Asia-Pacific Human Resources Best Practice Seminar
 Harbin, China
aci-asiapac.aero/

12 - 15 January

The International Transportation & Logistics Exhibition & Conference
 Karachi, Pakistan
intertranspakistan.com/

15 - 18 January

23rd Annual Schedulers & Dispatchers Conference
 San Diego, CA, USA
<http://web.nbaa.org/events/sdc/2012/>

16 January

Aero-political Forum
 Abu Dhabi, UAE
iata.org/events/Pages/aeropolitical-forum.aspx

19 - 20 January

National Aviation Maintenance Symposium
 Ann Arbor, MI, USA
<http://www.greatlakesaviationconference.com/pama>

19 - 21 January

Bahrain International Airshow
 Bahrain
bahraininternationalairshow.com/

22 - 24 January

Air Service Data and Planning Seminar
 Long Beach, CA, USA
aci-na.org/event/537

23 - 25 January

CANSO Middle East Conference
 Cairo, Egypt
avweb.com/events/12554.html

24 - 26 January

Introduction to SMS Workshop
 Miami, FL, USA
<http://web.nbaa.org/events/sms/20120124/>

14th Annual European Airfinance Conference

Dublin, Ireland
<http://euromoneyseminars.com/EventDetails/Dublin-2012.html>

25 - 27 January

Airport Media Relations Seminar
 Long Beach, CA, USA
aci-na.org/event/542

25 - 28 January

Nebraska Aviation Symposium
 Beatrice, NE, USA
aviationpros.com/event/10447142/nebraska-aviation-symposium

26 - 27 January

FAA Communications Conference
 Atlanta, GA, USA
faa.gov/airports/southern/airports_news_events/

1 - 2 February

AIME - Aircraft Interiors Middle East - Exhibition and Conference
 Dubai, UAE
<http://www.aime.aero/>

1 - 3 February

Air Cargo India 2012
 Mumbai, India
<http://www.statetimes.com/aci2012/>

2 - 5 February

Business Aviation Regional Forum
 New Orleans, LA, USA
<http://web.nbaa.org/events/forums/20120202/>

5 - 7 February

IATA Legal Symposium
 Shanghai, China
<http://www.iata.org/events/Pages/legal.aspx>

7 - 8 February

ICAO Regional Aviation Security Conference
 Caracas, Venezuela
<http://www2.icao.int/en/>

8 - 9 February

Aviation Carbon 2012
 London, UK
eraa.org/events/aviation-carbon-2012

Low Cost Airlines World Asia Pacific conference
 Singapore, Singapore
terrapinn.com/2012/low-cost-airlines/index.stm

Future Travel Experience Asia
 Kuala Lumpur, Malaysia
futuretravelexperience.com/fteasia/

9 - 10 February

Aircraft Registration Conference
 Delray Beach, FL, USA
<http://web.nbaa.org/events/arc/2012/>

2nd Annual USCAS: US Corporate Aviation Summit
 Miami, FL, USA
<http://www.aeropodium.com/conferenceprojects/uscas.html>

11 - 14 February

HELI-EXPO
 Dallas, TX, USA
rotor.com/Events/HELIEXPO2012.aspx

13 - 14 February

Transport Security conference
 London, UK
<http://www.smi-online.co.uk/events/overview.asp?is=16&ref=3760>

13 - 15 February

AAAE/IAAE Global Green Aviation Conference: Strategic Initiatives for a Sustainable Industry
 Queenstown, New Zealand
<http://events.aaae.org/sites/120203/index.cfm>

15 - 16 February

IATA Training and Qualification Initiative Conference
 London, UK
<http://www.iata.org/events/Pages/itqi.aspx>

15 - 17 February

AAAE Airports Energy Efficiency Forum
 West Palm Beach, FL, USA
<http://events.aaae.org/sites/120102/index.cfm>

17 - 18 February

Midwest Aircraft Maintenance Symposium & Trade Show
 Des Moines, IA, USA
<http://www.iapama.com/>

20 - 23 February

Aircraft Finance and Commercial Aviation Conference
 Geneva, Switzerland
<http://tradeshaw.free-press-release.com/>

21 - 22 February

Indian Business Aviation Expo
 New Delhi, India
<http://www.miuevents.com/ibae2012>

22 - 23 February

20th Annual Leadership Conference
 San Diego, CA, USA
<http://web.nbaa.org/events/leadership/2012/>

Business Airport Suppliers Expo 2012
 Cannes, France
<http://www.businessairportsuppliersexpo.com/>

Business Airport World Expo 2012
 Cannes, France
<http://www.businessairportworldexpo.com/>

25 February

WI Aviation Maintenance Training & IA Renewal
 Stevens Point, WI, USA
<http://www.aviationpros.com/event/10446000/2012-wi-aviation-maintenance-training-ia-renewal>

25 - 26 February

Northwest Aviation Conference & Trade Show
 Puyallup, WA, USA
<http://www.washington-aviation.org/NACoverview.html>

27 - 28 February

Airport Security Asia 2012
 Kuala Lumpur, Malaysia
<http://www.airportsecurityasia.com/Event.aspx?id=567058&MAC=ATba>

27 - 29 February

Airline Business and Global Flight (Loyalty 2012)
 Berlin, Germany
<http://www.loyalty-conference.com/>

28 - 29 February

Green Transportation & Logistics Summit
 Abu Dhabi, UAE
<http://www.arabianreach.com/gtls/>

29 February

ACC/AAAE Airport Planning, Design and Construction Symposium
 Denver, CO, USA
<http://events.aaae.org/sites/120201/>

24th Annual European Aviation Safety Seminar
 Dublin, Ireland
<http://flightsafety.org/aviation-safety-seminars/european-aviation-safety-seminar>