BRIDGING SKIES

ISSUE 13

# HARNESSING AIR TECHNOLOGY TO ENHANCE AIR TRAFFIC MANAGEMENT

**In a continuous effort to enhance air traffic management, Singapore is always looking for suitable technologies to enable more efficient use of airspace. One of the technologies it adopted recently is the Automatic Dependent Surveillance – Broadcast (ADS-B), an advanced technology that could widen its current surveillance coverage, and thus enhance the safety and efficiency in air traffic operations.**

ADS-B provides air traffic controllers with more accurate information on aircraft location as such position data are GPS-based and updated more frequently. This provides controllers with a clearer and more accurate picture of airspace utilisation. As such, controllers can manage the airspace in a safer and more efficient manner, leading to increased airspace capacity and flight efficiency.

## SURVEILLANCE TOOL WITH COMPLEMENTARY BENEFITS

ADS-B is an initiative advocated by the International Civil Aviation Organization (ICAO). It is a next generation surveillance tool that complements existing radar technologies. With data sharing between neighbouring Flight Information Regions (FIRs) or States, it could extend the air situation picture into airspace that is currently beyond radar coverage with good accuracy.

## ACCURACY OF FLIGHT POSITION REPORTS

As ADS-B is still a relatively new technology, radars will continue to be the primary tool used by air traffic controllers to manage air traffic. However, the errors of aircraft positions measured by radar typically vary from 0.12 Nm to 0.6 Nm. The errors increase when an aircraft is farther away from the radar antenna. On the other hand, the errors of aircraft positions reported by ADS-B are typically 0.1 Nm over a wide area, which is basically the error of GPS position measurements. Hence, aircraft positions reported by ADS-B are comparable or better than those measured by radar.

## INCREASED UPDATE FREQUENCY

ADS-B also boasts a faster update rate compared to traditional radar surveillance systems, making the airspace utilisation information displayed to air traffic controllers more reliable and accurate, allowing them to perform air traffic operations more effectively and safely. In future,

the faster update rate may also allow for precision air traffic control over a small area by giving controllers a finer resolution to work on.

**OPTIMISES AIR ROUTE CAPACITY**

With ADS-B, we will also be able to provide surveillance over areas which are not under radar coverage. Thus, ADS-B supports better use of airspace, through reduced aircraft to aircraft separation restrictions, thus enhancing surveillance awareness. For example, the standard aircraft separation in the non-radar airspace over the South China Sea is 80 Nm. By using the ADS-B, coupled with suitable communication facilities, aircraft separation can be reduced to as low as 5Nm, enhancing air route capacity by almost 16 times. With the increase in air route capacity, more flights can be assigned at their optimum flight levels translating to potential fuel savings for airlines and carbon emissions reduction. This increased capacity is necessary to cater to the high rate of growth of air traffic in the Asia-Pacific region.

**DATA-SHARING**

As our FIR spreads over a wide geographical area, we would need other countries to share their ADS-B information from the stations installed on their land. The sharing of data is important in achieving seamless surveillance of civil aircraft. Although it is also possible for countries to share radar information, it is often difficult due to the sensitivity of some information. In the case of ADS-B, information is considered less sensitive as the data is broadcasted from an aircraft. To this end, Singapore has been engaging our neighbours on the possibility of sharing ADS-B data.

The main differences between the a radar and ADS-B surveillance tool are summarised below:

| | Radar | ADS-B |
|---|---|---|
| Acquisition of aircraft position | Position of aircraft measured by radar using echo. | Position of aircraft measured by GPS and broadcasted by aircraft. |
| Cost | High investment and operating cost. | Low investment and operating cost |
| Accuracy | Typically vary from 0.12 nautical miles (Nm) to 0.6 Nm. | Typically around 0.1 Nm. |
| Update rate | 4 seconds (s) to 10s | 0.5s to 1 s |

**TOWARDS GREEN AVIATION AND ACHIEVING ECONOMIC SAVINGS**

The benefits of ADS-B collaboration are clear. In 2008, the International Air Transport Association (IATA) and Civil Air Navigation Services Organisation (CANSO) formulated a cost benefit study on ADS-B's implementation over the Western part of the South China Sea. Singapore participated in the study by providing three months' worth of flight data in Singapore's FIR. The results of the study were positive and encouraging. Based on the study, such collaboration could achieve savings of nearly 3 million pounds of fuel burn, annual reduction of 10 million pounds of carbon dioxide emission and annual economic savings of USD 4 million. The study has catalysed the ADS-B implementation in the region that hopes to establish a safer and more efficient air traffic network in Southeast Asia.

Singapore has been an active advocate in encouraging regional countries to implement ADS-B. It played host to the 10th ADS-B Study and Implementation Task Force Meeting in April this year. The meeting served as a platform for countries to share their experiences on ADS-B implementation and learn from one another. It is also the forum to discuss the harmonisation of technical requirements and air traffic control operational procedures in the Asia Pacific region.

Singapore plans to conduct the ADS-B operational trials starting in the second half of 2011, and will give priority for suitably equipped aircraft in the second half of 2012. Full implementation of the technology in the Western part of the Singapore FIR is expected to take place in 2013.