BRIDGING SKIES

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ADVANCING AIR TRAFFIC MANAGEMENT IN ASIA PACIFIC

The International Civil Aviation Organization (ICAO) estimates that air traffic in the Asia Pacific region will triple by 2030. With this anticipated growth in air traffic, the aviation industry faces many challenges. Major air navigation services providers (ANSPs) around the world acknowledge that air traffic management (ATM) is a critical link in the entire aviation ecosystem. ATM technologies and solutions must be developed to provide greater capacity, enhance efficiency and maintain high safety standards in the region. Bridging Skies shares how Singapore is taking steps to advance air traffic management in Asia Pacific.

Challenges in ATM

ANSPs worldwide are facing high traffic growth and experiencing increasing difficulties in coping with mounting air traffic volume and high service standards. Inefficiencies in ATM systems, caused by ground delays and bad weather, rigid route structures, and sub-optimal use of resources, need to be addressed before they become more pronounced in future. The disparity between aircraft and ground systems' technologies also limits the extent of air traffic service provision. It is generally recognised that ground systems are not harnessing aircraft avionics' prediction capabilities in flight trajectory to make traffic more manageable. As a

result, ATC is often bogged down by tactical control and routine tasks which can potentially be automated or better managed. Hence, there is also a need for ATM to keep up with the latest developments to enable provision of world-class service standards to customers. A step-change to modernise the ATM system is necessary to prevent it from becoming air transportation's weakest link.

Global Harmonisation is Key

The ATM system is inter-connected globally. For a plane in Singapore to reach its destination in London, it has to travel through various countries and regions. As such, ATM modernisation cannot be done in isolation as it involves regional and international harmonisation to ensure interoperability between air and ground, and ground to ground systems.

Globally, ICAO has exercised leadership to ensure ATM interoperability by introducing an Aviation System Block Upgrade (ASBU) initiative as a harmonising framework. The ASBU consists of implementable modules that come as a package to facilitate implementation. In this regard, Singapore maps its ATM Masterplan initiatives to the ASBU modules to ensure harmonisation and global systems interoperability.

ATM Transformation – The Future of ATM

Singapore, as a major air hub for the Asia Pacific region, recognises the importance to be an early adopter of ATM changes to meet the rising demand on capacity. As it is, Europe and the United States, having experienced severe air traffic situations ahead of other regions, realised the need to modernise their ATM systems and started the Single European Sky ATM Research (SESAR) and NextGEN programmes respectively to achieve ATM transformation. They invested in research and development, synchronising plans and actions of the different partners and federate resources. Many countries and regions are also embarking on similar programmes to develop their ATM systems and prepare for the impending challenges ahead.

Building a vibrant and self-sustaining ATM ecosystem

To meet demand and manage the complexities associated with increased air traffic in Singapore and around the region, the Civil Aviation Authority of Singapore (CAAS) embarked on a programme to transform Singapore's ATM capabilities and build a self-sustaining ecosystem for ATM in Singapore. In line with the ICAO "One Sky" vision, CAAS has unveiled its vision and plan to build Singapore as a Centre of Excellence for ATM (COE for ATM) to address the ATM needs of Singapore and the Asia Pacific.

As a COE for ATM, Singapore will house a vibrant and self-sustaining ATM ecosystem contributing to a wide range of ATM R&D activities. This will create a conducive environment for the convergence of minds, ideas and innovations to develop, test-bed and validate ATM concepts, technologies and solutions. These activities aim to generate ATM knowledge and expertise to develop and advance capabilities and solutions to meet the unique requirements of Singapore and the region.

The COE for ATM will also actively foster cross-sectoral and cross-boundary collaboration for harmonised ATM transformation in the Asia Pacific, in line with the global advancement of ATM. To kick things off, CAAS set up a Centre of Excellence for ATM Programme Fund (CEPF) of S$200 million for a period of 10 years to provide seed funding in the form of research grants and incentives to spur interest and jumpstart ATM R&D activities in Singapore.

Turning Vision into Reality

The CAAS' announcement of the COE for ATM has kindled the interest of leading American and European international organisations who share similar vision. Some six months since, CAAS continues to receive strong interest from both local and international stakeholders as well as organisations across the aviation industry to collaborate on various strategic ATM projects.

Today, CAAS has concluded partnership agreements with the US Federal Aviation Administration (FAA), the MITRE Corporation (MITRE), Single European Sky ATM Research Joint Undertaking (SESAR JU) and Airbus Prosky. These agreements cover a wide range of col-laborative activities such as R&D, test-bedding and validation of ATM concepts, technologies and solutions for the continued safety and efficiency of the growing air traffic in Singapore and the Asia-Pacific region. These include solutions to maximise airspace capacity, optimise aircraft operations and enhance air navigation services operational and human performance.

Crediting it as an "affirmation of the long range view of Singapore to maintain its visionary leadership in aviation," Dr Lillian Ryals, Vice President of The MITRE Corporation, said the measures would help position Singapore as an industry and thought leader in driving ATM efforts.

Airbus Prosky also recently strengthened its collaborative partnership with CAAS to jointly develop a Concept of Operations for Air Traffic Flow Management (ATFM) based on Collaborative Decision Making (CDM). This research project aims to address the challenges of air traffic flow in the context of the unique operational dynamics of the region.

Developing ATM Knowledge and Human Capital

To jumpstart ATM R&D in Singapore, CAAS and the Nanyang Technological University (NTU) have also inked an agreement to establish Singapore's first ATM research institute (ATMRI) for ATM. Over the next five years, CAAS will provide up to S$50 million, drawn from the S$200 million CEPF, to fund ATM R&D activities undertaken by the ATMRI, as well as ATM experts for the research projects. NTU, a world-renowned research-intensive university with diverse research expertise, will provide in-kind contributions of up to S$22 million, including research manpower and facilities. The ATMRI, with its office and laboratory housed at NTU, will integrate CAAS' operational ATM knowledge and expertise with NTU's research capabilities and talent pool.

“Through the conduct of high quality ATM R&D of world class standards, the ATMRI will develop innovative solutions to catalyse ATM transformation in Singapore and the Asia Pacific region, harmonised with ATM developments globally for interoperability,” said Yap Ong Heng, Director-General, CAAS.

Professor Chua Chee Kai, Chair, School of Mechanical and Aerospace Engineering added that NTU is confident that “[The Centre of Excellence] will put Singapore at the forefront of research in this dynamic field. Such initiatives will support the future growth of the nation’s air hub and air transport in the Asia Pacific.”

The ATMRI will undertake research projects that seek to create air traffic capacity and enhance efficiency of flight operations. The institute will also collaborate with international entities with interests and expertise in ATM, facilitating knowledge and expertise transfer. Through the translation of fundamental research into feasible applications, the industry will over time gather pertinent knowledge and expertise to provide training to develop and nurture critical manpower needed to support ATM R&D in Singapore and beyond.

NTU’s Deputy President and Provost, Freddy Boey, is optimistic about growing more partnerships that will facilitate regional harmonisation, adding that possible tie-ups could include renowned academic institutions, such as the Georgia Institute of Technology in the US and Munich’s Technical University in Germany. Partnerships with such foreign entities will inject global perspectives to the work undertaken by the institute and ensure that the concepts and solutions developed here are aligned with international standards.

Deepening Singapore’s Contribution to Asia Pacific ATM Harmonisation

Singapore has been actively contributing to regional ATM modernization and harmonisation efforts in support of ICAO’s “One Sky” vision, collaborating with ICAO, international and regional partners to address ATM challenges in the region. As a member of the Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) since 1991, CAAS has spearheaded and advanced many ATM initiatives that have significantly increased capacity, enhanced efficiency and improved safety for air traffic in the region.

With Singapore’s ATM transformation plan underway, and given the island city’s extensive experience as an ANSP, world-class research infrastructure and talent pool, Singapore aims to further enhance its contribution to international aviation by increasing collaborative efforts to achieve seamless ATM in the Asia Pacific. It plans to share the amassed knowledge of concepts, technologies and solutions customised for the Asia Pacific with its international partners. Such cross-border collaborations will further contribute to ATM harmonisation and interoperability across regions, building capabilities and performance, as well as aid the region in moving up the ATM value chain in line with the rest of the world.