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AEROSPACE

SINGAPORE

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FLIGHT PATH:

Industry Recovery and Outlook for 2023


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HOPE VS HEADWINDS

Aviation continues its recovery path. Changi Airport is restoring destinations, with 89 airlines operating over 4,800 weekly scheduled flights as of 1 October 2022. Passenger traffic has crossed the 60% mark and aircraft movements have exceeded 65%, versus 2019 pre-COVID levels.

However, aviation recovery in Asia will continue to lag other regions, so long as China continues its zero-COVID policy. New COVID-19 variants still pose a risk, but global food and fuel shortages, inflation, slowing economic growth and the war in Europe have taken over the news headlines. There are fears of a global recession in the coming year.

Climate change is high on the agenda and the industry seeks a green recovery, having set a 2050 net-zero carbon emissions target. The 41st ICAO General Assembly that convened in late September also settled on a 2050 date but called it an "aspirational target". Climate sustainability is something that will dominate our efforts for a long time to come.

Aerospace MRO and manufacturing in Singapore passed the 2019 production output benchmark in March 2022. We have entered growth mode and there is strong demand for talent. To support the pipeline of talent and facilitate recruitment, initiatives such as the One Aviation careers hub, AAIS Education Advisory Panel and various Work-Study programmes have been implemented and will hopefully bear fruit in the months and years ahead.

Such is the context of this issue of *Aerospace Singapore*, as we review the Asia Pacific MRO market outlook in the feature article.

SIA KHENG YOK / Chief Executive, AAIS

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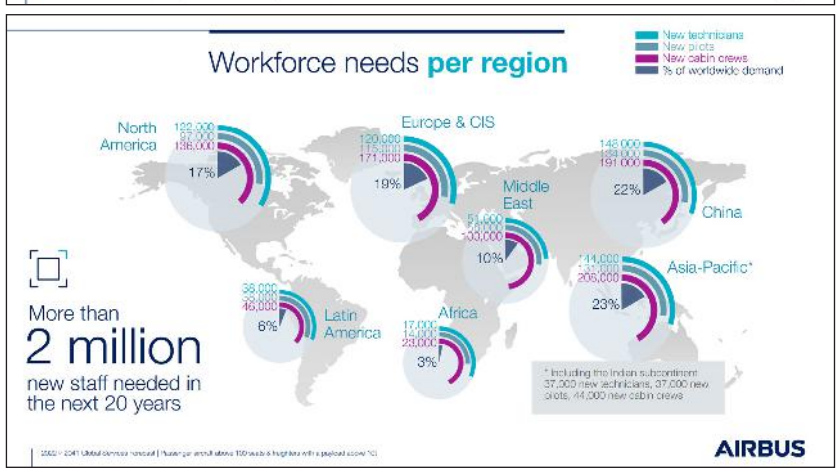
AIRBUS PROJECTS COMMERCIAL AIRCRAFT SERVICES MARKET TO DOUBLE BY 2041

A compounded annual growth rate of 3.7%, will lead to a doubling in the value of the services market in the next two decades

Airbus is projecting the commercial aviation services market to recover to pre-pandemic levels in 2023 and to double in value over the next 20 years – from US$95 billion this year to over US$230 billion in 2041, according to its latest Global Services Forecast (GSF) released on 6 October 2022.

The services market is expected to more than double over the next two decades, representing a +3.7% Compound Annual Growth Rate (CAGR), leading to a higher than ever demand for skilled labour amounting to 585,000 new pilots, 875,000 new cabin crew and 640,000 new technicians. In short, a total of more than two million new pilots, cabin crew and technicians will be needed in the next 20 years.



Infographics from Global Services Forecast 2022-2041. Source: Airbus

"Accelerated digitalisation of operations and maintenance as well as a higher proportion of latest generation aircraft in service will lead to a massive requirement for new skills and job creation, leveraging new tools and ways of working in order to further increase our sector's efficiency, reduce fuel consumption and emissions", said Philippe Mhun, Airbus EVP Programmes and Services.

In most aftermarket business domains, recovery to pre-crisis levels is expected in 2023, with maintenance and training markets at the forefront. Services have also hit the ground running, according to Airbus, with an additional 21% spend expected in 2022 vs 2021. The GSF noted that major business opportunities for aftermarket players were being created due to operators seeking more resilience and flexibility in contractual conditions, prioritising fuel efficiency solutions, looking to ease maintenance bottlenecks constrained by current capacity and reinforced connectivity enablement.

To reduce risk, Airbus anticipated that operators would become more focused on their core business and improving aircraft availability, mitigating their investments, and outsourcing non-core activities such as maintenance. This is expected to provide a boost to the market for such providers.

According to Airbus, new generation passenger aircraft will represent 95% of the operated fleet by 2041. As a direct consequence for services, the industry will require new competencies (digital, automation, connectivity, etc.), where services become fully integrated into the aircraft platform and aviation ecosystem.

ROLLS-ROYCE AND AIR CHINA TO SET UP US$380 MILLION ENGINE SERVICE JOINT VENTURE IN BEIJING

Rolls-Royce and Air China have announced a new 50/50 Joint Venture (JV) maintenance, repair and overhaul (MRO) facility in Beijing, China. The new facility, BAESL (Beijing Aero Engine Services Company Limited), will provide MRO support on the Rolls-Royce Trent 700, Trent XWB-84 and Trent 1000 aero engines. Air China currently has all three engine types in its fleet.

The facility will see the engine-maker offer MRO services to Air China as well as its other airline customers based in Greater China and beyond. At full capacity, which is expected to be achieved in the mid-2030s, BAESL will be able to support up to 250 shop visits per year.

President of Air China Ma Chongxian said, "With safe operation as top priority, Air China has long been committed to developing aircraft maintenance capabilities and ensuring the reliability of the fleet (…) In the future, Air China and Rolls-Royce will continue to deepen our profound partnership and start a new journey of cooperation in the field of high thrust engine maintenance. We look forward to building the Joint Venture into a world-class aero engine MRO company and increasing the volume of China's civil aero engine MRO industry."

Aerial view of Beijing Daxing International Airport designed by Zaha Hadid Architects. Photo: Wikimedia Commons

According to Rolls-Royce, its jet engines power 60% of China's widebody fleet, which translates to 550 aircraft in service or on order. The Trent 700 engines also power 90% of the country's Airbus A330 fleet and the Greater China fleet represents 20% of all Trent engines flying today.

The JV is an important part of Rolls-Royce's strategy for China, aligning in-region growth with in-region capacity providing customer proximity, which also supports sustainability goals by reducing overseas transportation of engines for MRO activity.

PARKER-HANNIFIN COMPLETES ACQUISITION OF MEGGITT

Parker-Hannifin Corporation has completed its acquisition of UK-based aerospace and defense supplier Meggitt for approximately £6.3 billion (approx. US$7.7 billion), according to an announcement from the two companies on 14 September 2022.

Roger Sherrard, President of Parker's Aerospace Group, added, "Parker has great respect for Meggitt, its heritage and its place in British industry. We are committed to being a responsible steward of the company and we plan to continue to innovate and invest in key markets that are of importance to Meggitt. The combination of Parker and Meggitt is exciting for both companies and provides our customers with a broad array of solutions for the global aerospace industry."

Headquartered in Coventry in the UK, Meggitt recorded an annual revenue of approximately £1.63 billion (approx. US$2 billion) for the 12 months ending 30 June 2022, with more than 9,000 team members and 40 manufacturing facilities globally, according to its website. The company has a diverse aerospace and defense exposure with technology and products on almost every major aircraft platform.

"We are excited to have reached the closing of what is a very compelling strategic and cultural combination," said Tom Williams, Chairman and Chief Executive Officer, Parker-Hannifin Corp. "Meggitt's complementary product portfolio and geographic footprint, as well as its proprietary and differentiated technologies, will significantly enhance Parker's capabilities, positioning us to provide a broader suite of solutions for aircraft and aeroengine components and systems."

ICAO: AIR TRAFFIC RECOVERY FAST APPROACHING PRE-PANDEMIC LEVELS

Analyses by the International Civil Aviation Organisation (ICAO) have revealed that global air transport seat capacity and passenger totals have reached an estimated 80% of pre-pandemic levels, with passenger revenue at around 72% of its 2019 high point. This is according to a media statement dated 19 September 2022, released ahead of the ICAO 41st Assembly held from 27 September to 7 October 2022.

According to ICAO figures, the number of air passengers carried from January to August 2022 increased by an estimated 55% compared to the same period in 2021. Aircraft flight departures increased by 28%, with overall seat capacity growing by 32% over the same period.

In terms of passenger revenues, and keeping yield and exchange rates at 2019 levels, there was an estimated 70% growth achieved for the first eight months of 2022 compared to the same period of 2021.

The number of passenger aircraft in service during the analysis period improved by 34% compared to the same period of last year and mirrored overall traffic recovery in reaching 80% of pre-pandemic levels.

The number of cargo aircraft in service showed a more modest increase of 4% compared to its pre-pandemic benchmark, due largely to their use remaining robust throughout COVID-19 in support of medical, humanitarian and other critical global supply chains, and increased consumer reliance on international e-commerce.

ICAO also projected that a majority of international route groups should fully recover to their pre-pandemic levels by either the fourth quarter of this year or the first quarter of 2023. It also noted that segments of East and North Asia could "prove to be slower", with recovery following later in 2023.

GE AVIATION OPENS NEW ASIA-PACIFIC SERVICE CENTRE IN AUSTRALIA

GE Aviation announced the opening a new state-of-the-art facility in Australia that will provide maintenance, repair and overhaul services on 7 September. The new US$8 million Asia-Pacific Service Centre located at Brisbane Airport will position the OEM to support more customers and expand its presence across the region.

The facility is touted as the largest GE Aviation Systems facility in the Asia-Pacific region. It will support avionics, flight management, electrical power and DOWTY propeller systems on various aircraft including the Boeing 737 and 787, Q400 and F-50 regional aircraft and the Royal Australian Air Force's fleet of C-130J Super Hercules and C-27J Spartan Military Transport Aircraft. The high-tech facility will employ more than 80 people.

GE Australia Country Leader Sam Maresh said, "We are delighted to mark a new chapter in our Australian operations and our near two-decade relationship with Brisbane Airport with the opening of a leading aviation servicing facility that creates fresh opportunities for GE Aviation."

GE supplies commercial aircraft engines to many local carriers in Australia, including Qantas, Jetstar, Air New Zealand, Virgin Australia and Regional Express. 70% of Australia's domestic flights are powered by GE engines, according to the global engine supplier. The company also supplies the Australian Government with engines and systems for military and marine use.

SINGAPORE SCORES TOP MARKS IN GLOBAL AVIATION SAFETY AUDIT

Singapore has achieved good results in a global aviation safety audit and an implementation assessment, according to results released by the International Civil Aviation Organization (ICAO) which conducted the audit and assessment.

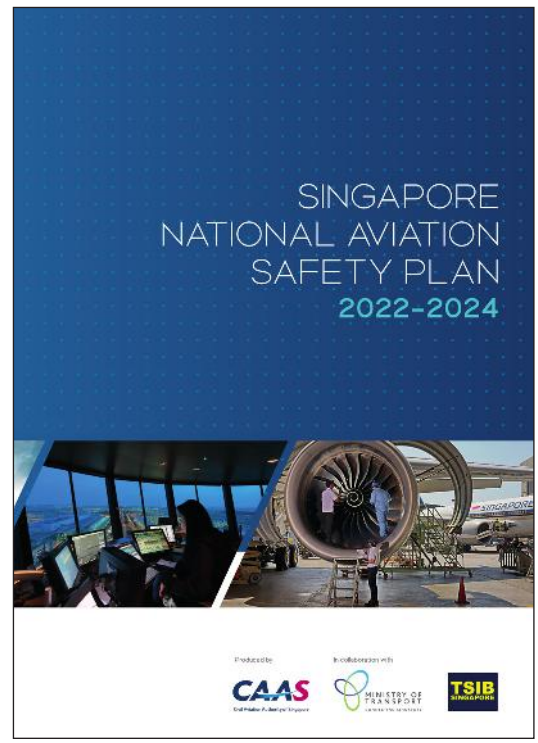
In an announcement made on 16 September 2022, the Civil Aviation Authority of Singapore (CAAS) unveiled that Singapore had completed an ICAO Universal Safety Oversight Audit Programme (USOAP) audit with zero findings and attained an Effective Implementation score of 99.7% - the highest score achieved by any State in the USOAP audit to date. The global average score was 67.5%.

The ICAO USOAP audit assesses a Member State's safety oversight system and checks its compliance with and implementation of ICAO standards and recommended practices and guidance materials. All 193 ICAO Member States are required to undergo the USOAP audit periodically. The last audit of Singapore was conducted in 2010. At that time, Singapore achieved a score of 98.6%. The latest ICAO USOAP audit of Singapore was conducted from 18 to 22 April 2022.

Singapore is First Member State to Undergo Phase 2 SSPIA

CAAS also revealed that Singapore had separately also completed the ICAO Phase 2 State Safety Programme Implementation Assessment (SSPIA) which goes beyond an audit of compliance with standards and recommended practices to assess the effectiveness and maturity of its State Safety Programme. The level of maturity of each of the 44 aspects of the State Safety Programme was assessed and graded from "Level 0" to "Level 4". States have been assessed only up to "Level 3" as the Phase 2 SSPIA was only introduced in 2021. Singapore's SSPIA was conducted from 4 to 14 April 2022 and was assessed to be at "Level 3" in 39 of the 44 aspects and "Level 2" for the remaining five aspects.

Singapore was the first ICAO Member State to undergo the Phase 2 SSPIA. The strong results attained from the assessment acknowledge that Singapore has in place a robust and effective State Safety Programme to proactively identify, manage and mitigate safety risks.



Singapore's National Aviation Safety Plan, released in April 2022. Source: CAAS

Upholding High Aviation Safety Standards

Director-General of the CAAS Han Kok Juan, said: "The ICAO safety audit and assessment are timely health checks and affirmations of Singapore's unwavering efforts to rise above the safety-related challenges brought about by COVID-19 and uphold the highest safety standards as we reclaim and rebuild our position as a global air hub. The good results notwithstanding, we will not take safety for granted. Aviation is a complex, highly inter-connected system comprising many companies, big and small, and individual safety actors including pilots, air traffic controllers and maintenance technicians. The Singapore aviation sector must continue to prioritise and keep a close eye on safety as we ramp up manpower and operations for the year-end peak."

CAAS launched Singapore's first-ever Safety Charter for the aviation sector in March 2022 to underscore the importance of safety leadership in fostering a strong and positive safety culture. In April 2022, CAAS unveiled Singapore's first National Aviation Safety Plan, setting out more than 50 initiatives that the sector will embark on over the next three years to further strengthen the safety regime.

SOUTHEAST ASIA'S FIRST HELICOPTER FLIGHT USING SUSTAINABLE AVIATION FUEL TAKES OFF FROM SINGAPORE

On 26 September 2022, Bell's next generation five-seater helicopter, the Bell 505, fuelled with Sustainable Aviation Fuel (SAF) took off at Seletar Airport in Singapore for a demonstration flight. This was the first ever helicopter flight fuelled with SAF in Southeast Asia.

The milestone was achieved through close cooperation between Bell, Safran Helicopter Engines and Neste, with Jet Aviation and Shell Aviation enabling the blended SAF to be uplifted through their facilities at Seletar Airport.

The demo flight showcased the commitment of the business aviation community to contribute to the industry's ambitious emissions reduction goals by adopting SAF as a key element in helping achieve these goals.

"Bell has been in Southeast Asia for more than 40 years and we are proud to operate the first SAF helicopter flight here on our Bell 505," said Jacinto Monge, managing director, Asia Pacific, Bell. "Today's flight demonstrates our commitment to incorporating SAF into our customer demonstration aircraft globally, supporting Textron's Achieve 2025 Sustainable Footprint goal for 20% reduction in greenhouse gas emissions."

The fuel used for the flight – Neste MY Sustainable Aviation Fuel – reduces greenhouse gas emissions by up to 80% over the fuel's life cycle compared to fossil jet fuel use. SAF can already be used up to 50% blended with conventional jet fuel, and Safran helicopter engines were already certified for this.

"We strongly believe in SAF, as it contributes to significantly reducing CO2 emissions. As all our helicopter engines, the Arrius 2R, is already certified to operate on up to 50% SAF, and we are fully ready to assist all Bell 505 operators worldwide in their transition from conventional fossil fuels to SAF. With our products, we are proud to play an active role in the development of decarbonization initiatives in Asia Pacific," said Valerie Patuel, Managing Director of Safran Helicopter Engines Asia, CEO & Country General Delegate of Safran Singapore.

"The ambitious emissions reduction goals of the aviation industry can only be achieved through wide-scale adoption and use of sustainable aviation fuel and cooperation across the stakeholders in the aviation ecosystem…. We showcased that SAF can safely and easily be used also for helicopter operations. I am also proud that this milestone was achieved in Singapore," said Sami Jauhiainen, Vice President APAC, Renewable Aviation at Neste.

According to Neste, SAF delivers the performance of conventional jet fuel but with a significantly smaller carbon footprint on a life cycle basis. Neste MY SAF is produced 100% from sustainably-sourced, renewable waste and residue raw materials, such as used cooking oil and animal fat waste.

With the expansion of Neste's Singapore refinery nearing completion, and the ongoing modification of its Rotterdam refinery, the company will be able to produce up to 1.5 million tons of SAF by the end of 2023, ready to support aviation globally and in the Asia-Pacific region, added Jauhiainen.

Representatives of Neste, Bell, Safran and industry

P&W TO ESTABLISH SINGAPORE TECHNOLOGY ACCELERATOR

Technologies developed in Singapore will be applied across Pratt & Whitney's global maintenance, repair and overhaul (MRO) footprint.

Aerospace giant, Pratt & Whitney, will be establishing a technology accelerator in Singapore in collaboration with the Singapore Economic Development Board (EDB).

The facility, serving as a centre of excellence for technology advancement, aims to accelerate the development and deployment of technology insertion projects across Pratt & Whitney's four Singapore-based MRO facilities over the next five years. The projects, expected to be worth at least S$31 million (or US$22 million), will focus on automation, advanced inspection, connected factory and digital twin, helping to enhance connectivity and intelligence across the company's MRO operations.

The Singapore technology accelerator will be located at the Seletar Aerospace Park. Expected to be ready for occupation in the fourth quarter of this year, it will add 16 new positions, which the company plans to fill with local, full-time employees.

"The technology accelerator signals just how relevant and important a role technology has played, and continues to play, in the aerospace industry," said Gilbert Sim, Director, Aftermarket Global Operations Technology and CORE, Pratt & Whitney. "The push for digitalisation is underway across our facilities in Singapore, and the technology accelerator will increase the speed and scalability of these technology projects."

Pratt & Whitney's Asia-Pacific MRO facilities already boast world-leading technology applications including the first-in-MRO application of 3D printing for aero-engine component details, robotics and automation and an industrial simulation software pilot that has already resulted in optimised floor space and increased productivity.

A robot developed by engineers at Pratt & Whitney's Singapore engine centre that can assist technicians on shop floors. Photo: Pratt & Whitney

Pratt & Whitney is also in discussions with Singapore's Agency for Science, Technology and Research (A*STAR) on technology innovation. An agency of the Ministry of Trade and Industry of Singapore, A*STAR hosts Singapore's aerospace program for innovation in emerging technologies and commercial application of technologies for aerospace.

LIEBHERR-SINGAPORE EXPANDS ITS AEROSPACE MRO CAPABILITIES

Liebherr-Singapore's Aerospace Division celebrated the expansion of its aerospace MRO capabilities through its new center of competence on 20 September 2022, together with guests from the industry and government agencies.

The latest capability expansions saw the installation and commissioning of a new high performance hydraulic test cell as well as the establishment of a full-service repair and overhaul shop for aircraft Heat Transfer Equipment.

The substantial investment enables the company to offer state-of-the-art repair capabilities for an extended scope of Liebherr components to its APAC customers.

"The expansion of our Aerospace MRO capacities is one of the key elements for continuous extension of the customer support and services portfolio of our Singapore Service Centre. It enables us to service even more components in-house and in region, thus eliminating logistic routings and in parallel reducing turnaround times", emphasised Ekkehard Pracht, General Manager Aerospace, Liebherr-Singapore Pte Ltd.

Established since 1995, Liebherr-Singapore provides support and services for the OEM's products including flight controls, landing gears as well as gears and gearboxes as well as air management systems. With Part 145 (e.g. CAAS, CAAC, EASA, and FAA) certification, the

Liebherr executives and distinguished guests at the Opening Ceremony of the repair facility expansion. Photo: Liebherr-Singapore.

Singapore service center has the capability of testing, repairing and overhauling components including air-conditioning, cabin pressure controls, bleed systems, system controllers, flight control components and hydraulic actuators.

SATS TO ACQUIRE WFS TO BECOME LARGEST GLOBAL AIR CARGO HANDLER

Transformational deal creates Americas-Europe-APAC network with more than 200 cargo and ground handling stations in over 20 countries

Singapore main ground handling and in-flight catering service provider, SATS, announced a proposed acquisition of Worldwide Flight Services (WFS), the world's largest air cargo handling firm on 28 September 2022. According to SATS, the strategic acquisition will advance its "twin growth engine strategy", expand its network and capabilities in Asia and globally, and strengthen its Singapore core. SATS will acquire WFS from an affiliate for a cash consideration of EUR 1.187 billion (approx. S$1.6 billion).

SATS aims to create a global leader in the aviation services sector. Kerry Mok, President and Chief Executive Officer of SATS, said: "This is a transformational opportunity for SATS and our proposed acquisition of WFS will create a global leader that can become the go-to provider of mission critical aviation services. From our hub in Singapore, and in our newly combined markets, SATS and WFS will be at the heart of global trade flows, operating in the world's busiest airports and supporting the biggest companies."

WFS operates in five of the top 10 cargo airports in North America and Europe, including Los Angeles, Chicago, Miami, Frankfurt and Paris. SATS is already present in four of the top 10 cargo airports in Asia, including Hong Kong, Taipei, Singapore and Beijing. The acquisition of WFS will enable SATS to better serve air cargo customers in strategic hubs in Asia, Europe and the US, as well as in complementary new growth markets including Latin America and Africa. The combined network covers trade routes responsible for more than 50% of global air cargo volume.

WFS will become a wholly owned subsidiary of SATS after the proposed acquisition and will continue to be led by Chief Executive Officer Craig Smyth, and other key senior management. The proposed transaction is expected to complete by March 2023 subject to conditions, as well as requisite shareholder and regulatory approvals.

ST ENGINEERING RENEWS CONTRACT FOR BOEING 737-800 COMPONENT MRO WITH NOK AIR

ST Engineering's Aerospace arm has secured a five-year component Maintenance-By-the-Hour (MBH™) contract to service the Boeing 737-800 fleet of Thai budget carrier, Nok Air, according to its announcement on 19 September.

Under the multi-year component MBH™ contract, ST Engineering will provide a full suite of component support solutions covering component repair management, pool support and dedicated consignment stock in Bangkok for the airline's entire fleet of Boeing 737-800 aircraft.

Wutthiphum Jurangkool, Chief Executive Officer of Nok Air, said, "We are happy to renew our partnership with ST Engineering and look forward to a mutually beneficial working relationship. Our decision was based on the good reputation and quality services of ST Engineering."

Jeffrey Lam, President of Commercial Aerospace at ST Engineering, said, "As flying volume steadily returns, we are working closely with our customers to ensure that quality maintenance services can keep pace with their recovery and growth. The renewal of this partnership with Nok Air reaffirms our commitment to be a long-term partner to the airline, and to continue supporting them with reliable and high-quality services."

ST Engineering's aerospace component MBH™ programmes supports more than 1,000 aircraft and provides integrated component solutions for over 23,500 unique aircraft parts. With component MRO facilities located in Singapore, Hanoi and Ho Chi Minh City in Vietnam, as well as Stockholm, Sweden, ST Engineering's Commercial Aerospace business delivers more than 80,000 components to its customers annually.

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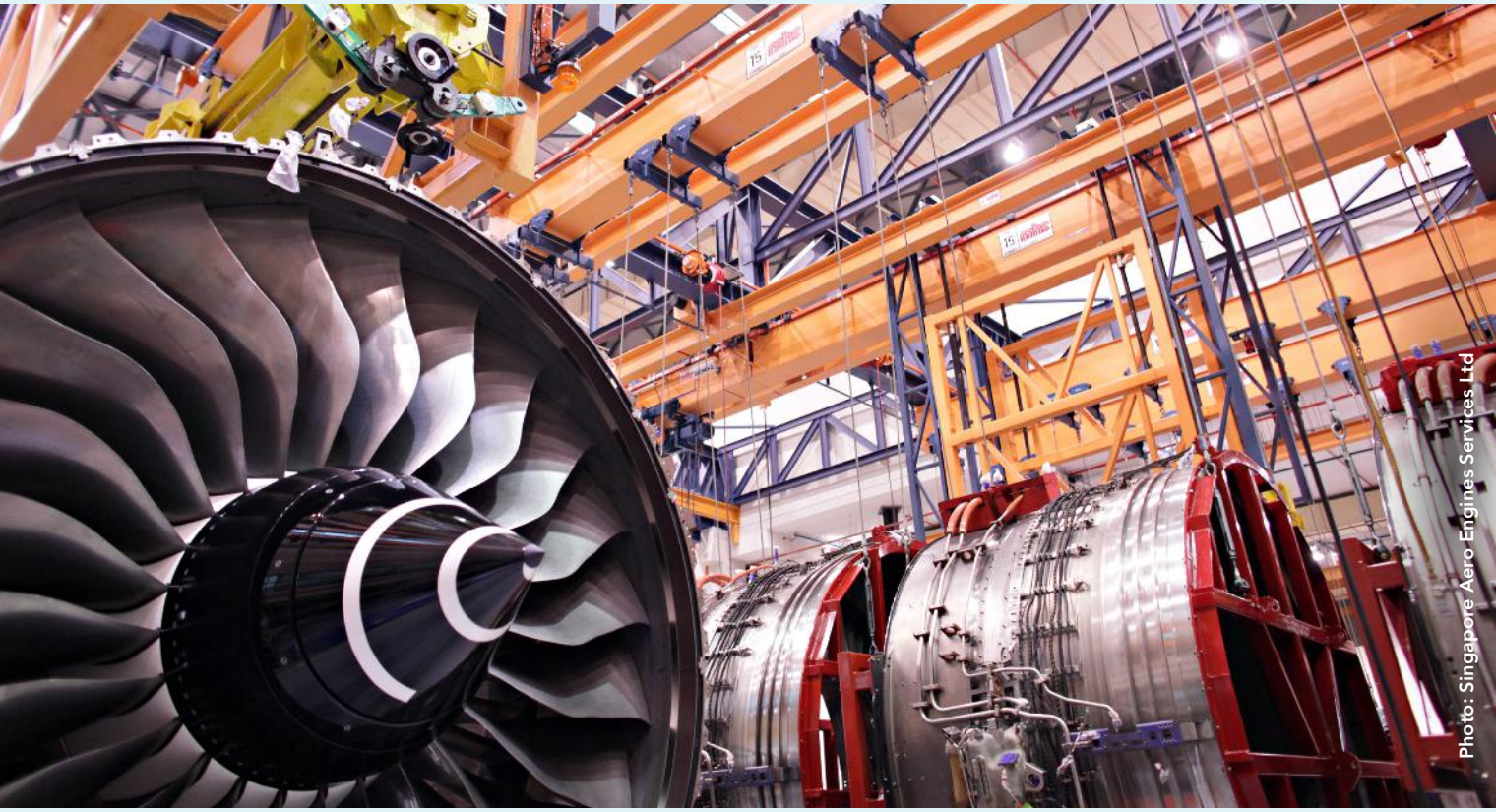


Photo: Singapore Aero Engines Services Ltd

INDUSTRY RECOVERY AND OUTLOOK FOR 2023

Text by Joshua Ng, Alton Aviation Consultancy

With more countries opening their borders, the global aviation industry is on the path of recovery from the impact of the COVID-19 pandemic. This recovery, however, has been bumpy and uneven, with the geopolitical and macroeconomic environment threatening its trajectory. What are the expectations for the aviation industry, aerospace MRO and the aftermarket in 2023 and beyond? In this *Aerospace Singapore* feature, Alton Aviation Consultancy presents its analyses and projections.

The magnitude and length of impact from the COVID-19 pandemic is unlike any prior economic and geopolitical shock aviation had ever seen. Revenue passenger kilometers (RPKs) fell by some 66% at the height of the pandemic, overshadowing events such as the global financial crisis, SARS, and the Asian financial crisis.

Air Traffic Recovery Perspectives

After particularly difficult years in 2020 and 2021, the air travel industry started seeing recovery, first through domestic then international flights in late 2021 through 2022. The current market consensus is that global passenger traffic will recover to 2019 levels in late 2023 / early 2024. The shape of this recovery depends on the region and the type of travel:

- *Regional Markets*. Europe, North America, and Latin America are expected to be among the major geographical markets to first achieve recovery (by late 2022) as these regions were the first to open up. Excluding China, which is slowly easing its zero-COVID policy, Asia should see recovery through 2023. It is worth noting that even while travel restrictions seem to be easing across APAC, the recovery trajectory will continue to be challenging in the near-term, and dependent on how quickly China opens up.
- *Travel Purpose.* Pent-up demand for leisure travel is driving global recovery with people keen to travel again after two years of restrictions. Business travel, on the other hand, has been lagging in its recovery. Virtually all businesses and organisations went from onsite to online during the pandemic, which created an opportunity for companies to review air travel requirements to reduce their cost as well as their carbon footprint. Even if business travel eventually returns as it did historically, it would likely be in phases and driven by proximity, reason for travel and industry sector.
- *Travel Distance.* Domestic or short-haul travel have been less hampered by travel restrictions, and recovered faster than expected in most geographies. Full recovery of the segment is expected by early 2023. International regional travel, on the other hand, is expected to lag in recovery by six months followed by international long-haul travel recovery which is only expected to recover by 2024. Chinese outbound travel is expected to spur international travel recovery rates within the Asia Pacific region once restrictions are eased for its population.

Photo: Vitor Almeida via Pexels

Photo: Hanson Lu via Unsplash

Headwinds will affect the air traffic recovery trajectory

While the world transitions from a pandemic to an endemic situation, other emerging economic and geopolitical themes threaten to derail the recovery of aviation.

- *Higher energy prices.* Sanctions that were imposed against Russia since early 2022 have severely strained the global energy market, raising fuel prices and fuel price volatility for the near term. Fuel costs in 1H2022 were estimated to account for about 24% of airlines' operating costs. In the near term, energy cost is expected to increase with the likelihood of taxes on carbon emissions as well as increasing usage of Sustainable Aviation Fuels and other green fuels.
- *Inflation and rise in lending rates.* Across many regions, the Consumer Price Index (CPI) has climbed significantly compared to a year ago. Between July 2021 and July 2022, inflation had increased year-on-year by 8.5% in USA, 8.9% in Europe and 10.1% in the UK largely due to the supply shortages. To combat rising inflation, central banks across the world have been raising lending rates. As a result of increased borrowing and financing costs, we can expect more prudent investment allocations for inventory, capital investments, and M&A activities, including within the aviation sector.

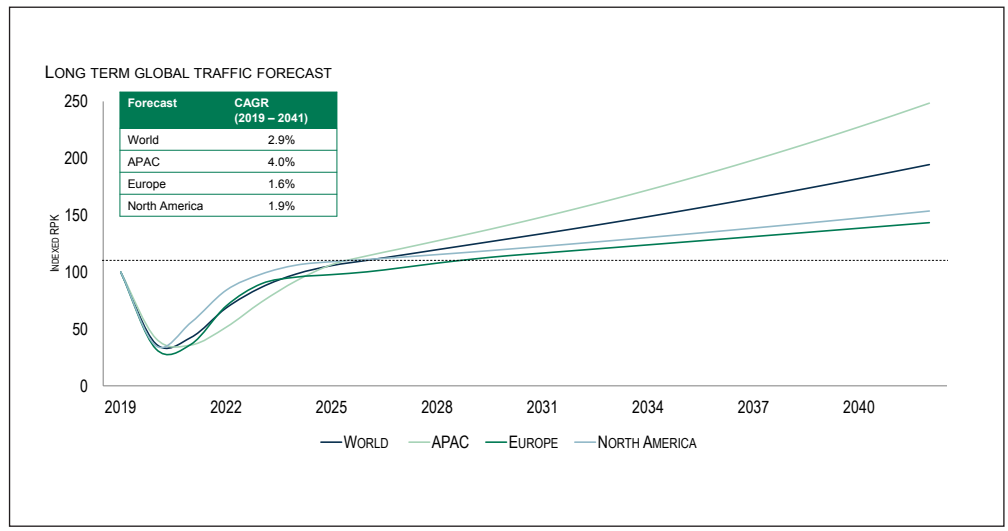


Figure 1: Long-term global traffic forecast (Alton Aviation Consultancy, 2022)

- *Strengthening of the US dollar.* Amidst the recent geopolitical and trade policy events, the US dollar has strengthened significantly against major currencies. This directly impacts airlines in multiple ways given that the transactional currency for most major cost items are in US dollars while revenues are largely denominated in the local currency. Conversely, there are tailwinds for manufacturing and MRO in emerging markets where revenues are in US dollars while labor costs are in the local currency.

Long-term Air Traffic Forecast

In the long run, the fundamental drivers of global air traffic remain unchanged. At a global level, Alton forecasts a 2.9% CAGR between 2019 and 2041, taking into account the effects of the COVID-19 pandemic. The Asia Pacific region is expected to grow at a rate above the global average at 4.0% CAGR, while other regions like Europe and North America are anticipated to grow at 1.6% CAGR and 1.9% CAGR respectively in the same forecast period.

FLEET FORECAST

With air traffic recovery underway, Alton expects the near-term fleet size to reach pre-pandemic levels in-line with traffic recovery. Longer-term global GDP growth is expected to further drive growth of the commercial aviation fleet.

As of January 2022, the commercial aviation fleet is estimated to consist of 30,200 in-service aircraft and projected to grow at 3.2% per annum for the next 10 years to about 42,000 aircraft in 2032. Narrowbody aircraft are expected to drive the commercial fleet growth, with a gain in market share from 58% today to 67% in 2032 at a CAGR of 5.0% per annum in the next 10 years. Widebody aircraft are expected to reduce from 19% to 17% of the total fleet as operators' preferences are anticipated to shift towards smaller aircraft.

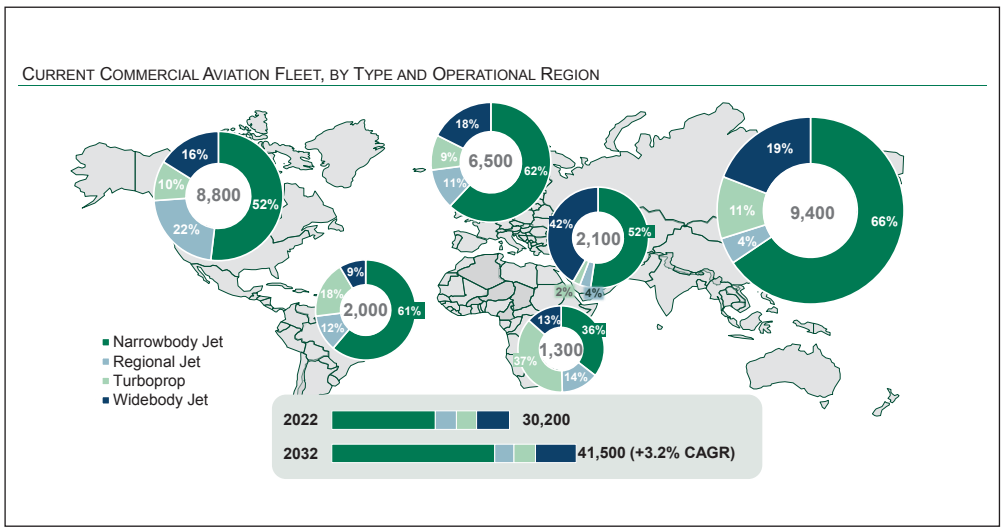


Figure 2: Commercial aviation fleet 2022 vs. 2032 (Alton Aviation Consultancy, 2022)

Asia Pacific Fleet Forecast

Geographically, Asia Pacific will add more aircraft to the global fleet than any other region, with the addition of about 5,800 aircraft, accounting for over 50% of net fleet growth in the next 10 years. Correspondingly, Asia Pacific will experience the highest fleet growth CAGR at 4.9%, exceeding the growth in other world regions, which are expected to have CAGR between 2.0% and 3.7%.

By Alton's estimation, Airbus aircraft will constitute a higher share of the narrowbody aircraft, while Boeing aircraft will have a larger share of the widebody market in the Asia Pacific region. Airbus aircraft is estimated to account for 59% of the narrowbody fleet while Boeing aircraft will account for 60% of widebody fleet market share by 2032.

Given the increasing share of narrowbodies for the commercial aviation fleet, the CFM56-5B/7B (driven by the Airbus A320 family and Boeing 737 classic / next generation) and LEAP-1A/1B (driven by the Airbus A320neo family and Boeing 737 MAX) are expected to become the prominent engines in the market. The two engine types combined are expected to comprise more than 50% of Asia Pacific's fleet by 2032.

Supply-side Challenges

As airlines recognize the need for aircraft to drive post-pandemic growth, demand for new aircraft is robust. Airbus has 'sold-out' its A320neo family production line until the second half of this decade and other popular narrowbody models such as the A220 and 737 MAX have multi-year wait times.

In the near term, supply chain challenges would continue to impact new aircraft deliveries. At this time, the industry is facing challenges to ramp-up production rates that were cut during the pandemic. Labour shortage is an issue which is prevalent across the industry. Additionally,

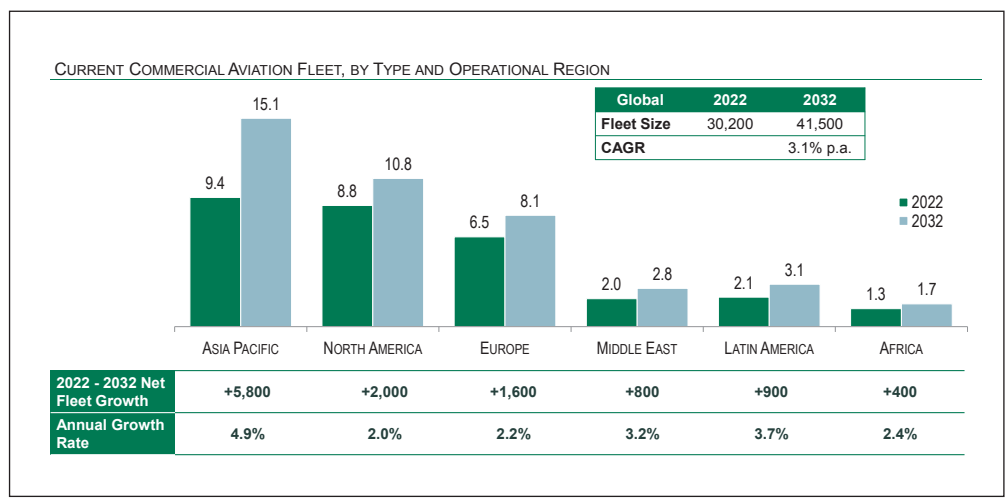


Figure 3: Commercial aviation fleet forecast by region (Alton Aviation Consultancy, 2022)

10-YEAR AIRCRAFT BACKLOG BY MODEL (AS AT JUL 2022)

Aircraft Family	Backlog	Monthly Production Rate
Narrowbody Jets		
A320neo	5,831	50 → 75 *by 2025*
737 MAX	4,340	31 → 47 *by 2H2023*
A220	553	6 → 14 *by 2025*
Widebody Jets		
787	500	2 → 5 *"over time"*
A350	451	5 → 6 *by 1H2023*
777X	341	3
A330neo	196	3

Figure 4 Aircraft backlog and production rates (Alton Aviation Consultancy, 2022)

the shortage of raw materials and manufacturing capacity due to the ongoing Russia-Ukraine conflict is affecting multiple areas in the supply chain. Delivery of engines, for example, have been a particular issue, with OEMs like Airbus having to store fully assembled aircraft awaiting engines. Having acknowledged these challenges, aircraft manufacturers are working towards solving these issues with their suppliers and new aircraft supply is making steady improvements. Manufacturers are responding by leveraging new strategies such as dual or triple sourcing and nearshoring to mitigate supply chain risks.

MRO FORECAST

The global commercial MRO market is expected to reach US$120B in 2032 from US$78B in 2022, growing at a CAGR of 4.4% per annum between the 10-year period. Asia Pacific is expected to generate the highest spend over the next decade accounting for over 35% of the global MRO spend, growing from US$14B to US$21B at a CAGR of 4.8%. The growth of the narrowbody fleet in Asia Pacific is a large contributor to this growth. Engine MRO makes up the lion's share of total MRO spend (~50%) and is also expected to grow from US$37B to US$59B at a CAGR of 4.8% over the next decade. Component MRO, line MRO, airframe MRO, and modifications make up the remaining MRO spend.

Engine MRO Trends

Greater utilisation of narrowbody and cargo engine types. Driven by domestic and short-haul international recovery, narrowbody aircraft engines such as the current generation CFM56-5B/7Bs and V2500s saw utilisation pick up the soonest in aviation's post-pandemic recovery. Greater fuel efficiency on new generation narrowbody engines such as the LEAP-1A and PW1100 also led to greater usage during the pandemic and recovery phase. Legacy engine types such as the CF6 and PW4000 saw increased engine utilisation throughout the pandemic due to intensive cargo freighter utilisation with increase in engine shop demand for cargo engine types as a result.

Contrary to narrowbody passenger aircraft and cargo freighter aircraft engine utilisation, widebody aircraft engine utilisation is only just starting to pick up and is expected to ramp up in tandem as international travel gears up towards the end of 2023.

Green time engines and USM. Throughout the pandemic, airlines employed various strategies to minimize engine MRO cost. With significant portions of their fleets parked/ stored (up to 60% of the total global fleet at the height of the pandemic), airlines opted for greater use of green time engines to defer engine shop visits.

Airlines also sought tailored work-scopes and lowered work content to reduce shop

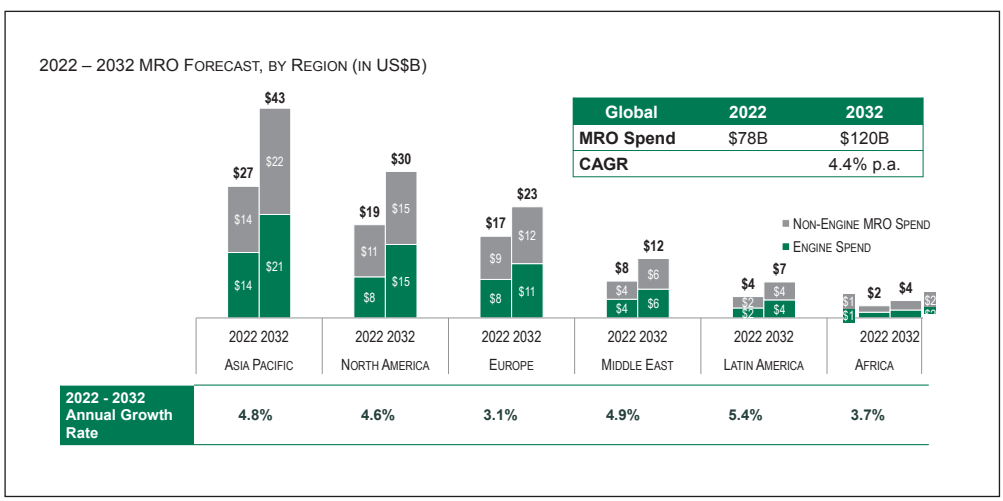


Figure 5: Global MRO demand forecast by segment and region

visit costs. Many airlines increased the use of used serviceable material (USM) and performed module swaps to avoid costlier new part replacements and extensive engine module repair and overhauls. On-wing repairs were also preferred to avoid heavier costs of shopping engines.

Near-term Engine MRO demand to increase. Alton anticipates high near-term engine maintenance demand as "spare" engines in the market require overhaul. Furthermore, with green-time engines being in run-out condition, the availability of USM content is reduced leading to an increase in new part replacement demand.

Alton is also observing an increase in engine overhaul lead times, contributed by near-term parts supply chain challenges as well as labour challenges. Engine shop overhaul capacity is also tight, and engine operators need to plan further in advance to secure engine overhaul slots for their engines.

Photo: Pratt & Whitney

MRO Labour Challenges

A major issue for the industry at present is a shortage of skilled technicians. The industry had lost many experienced staff as companies globally were forced to respond to the sudden and unexpected demand shock by initiating a wave of job cuts and early retirements to stay afloat. This poses additional challenges for the industry in the post-pandemic environment as it seeks to increase its workforce to cope with returning demand. We can expect a more moderate ramp up in MRO capacity in the near term as a new labour force needs to be trained for the industry.

Anticipating this, we can also expect the MROs to adjust salaries and benefits for technicians in a bid to retain current talents and avoid further loss to competitors and other industries. In the long run, it would be beneficial for MROs to collaborate with schools and institutions in their respective regions to build a pipeline of fresh graduates. To sustain their manpower supply for the future, MROs can consider directly getting involved in providing aftermarket training resources.

CONCLUSION

Globally, the aviation industry is expected to recover from the COVID-19 pandemic, although this is predicated on a recovery to pre-COVID traffic and fleet growth as well as longer term economic growth.

Despite being slower to recover, the Asia Pacific region will continue to be the largest aviation market globally. The APAC fleet is expected to grow from 9,400 aircraft to 15,100 aircraft between 2022 and 2032, and this will drive the region's MRO spend from $27B to $43B in the same period.

Evolving supply chain strategies at OEMs and MROs may lead to increased investment in the region due to a combination of factors including being closer to the customer base, diversification of the supply chain and advantageous investments in the economic business case. While there are near term challenges affecting the recovery, players in the Asia Pacific aerospace market stand to benefit.

DEVELOPING A SUSTAINABLE AIR HUB IN SINGAPORE

Photo: Jewel Changi Airport Trustee Pte. Ltd.

In the past decade, the international civil aviation sector has awakened to its key role in helping to fight climate change by taking firm and decisive actions to decarbonise its operations. It is well-recognised that the push for sustainable aviation will require coordinated State actions, cross sectoral collaboration, public-private partnership and greater climate consciousness amongst corporates and the travelling public.

Singapore has started work on this by voluntarily taking part in the ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) in its pilot phase. Additionally, Singapore is embarking on a one-year pilot to use blended Sustainable Aviation Fuel (SAF) at Changi Airport. As a next step, the Civil Aviation Authority of Singapore (CAAS) is developing a Sustainable Air Hub Blueprint to bring together all these efforts and to set a roadmap with clear 2030 and 2050 targets and tangible pathways for achieving them.

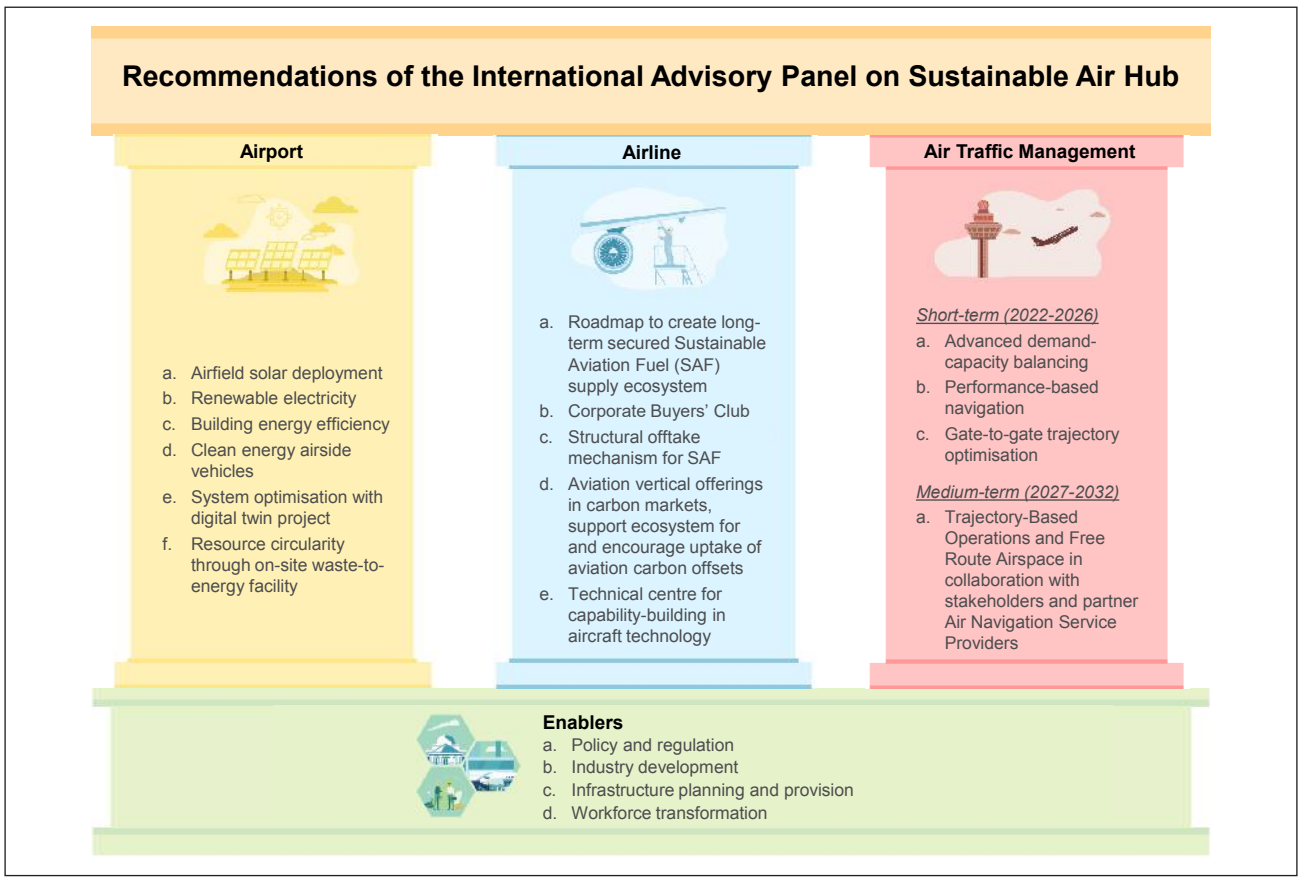
An International Advisory Panel (IAP) on Sustainable Air Hub has submitted its report to Singapore's Minister for Transport and Minister-in-charge of Trade Relations, Mr S Iswaran, in September 2022. The report details 15 key initiatives across three key aviation domains of airport, airline and air traffic management that Singapore could embark on as tangible pathways to decarbonise the aviation sector.

Formed in February 2022 under the Ministry of Transport and CAAS, the IAP brought together 20 industry, technology, and knowledge partners from Singapore and around the world to discuss how international aviation can be made more sustainable and accessible for all, and how Singapore can contribute to this international effort. Members of the IAP include Directors-Generals from key aviation International Organisations, as well as C-suite executives from the aviation industry and renowned knowledge and technology partners.

In a period of six months, the IAP conducted four physical and virtual meetings to exchange views on the vision and strategies to chart the way forward for the Singapore air hub. To canvass ideas from a wider array of stakeholders, IAP members moderated six deep dive sessions for three aviation domains, namely airport, airline and air traffic management. These sessions, which involved more than 120 representatives from 40 local and international partners, generated ideas and provided insights to the IAP recommendations.

Key Recommendations by the IAP

The IAP sought to contribute to the development of the Singapore Sustainable Air Hub Blueprint by proposing specific projects that Singapore can initiate, leveraging its hub position and strong partnerships with international bodies, other countries and private companies. In doing so, the IAP had taken an action-oriented, industry-driven approach, tapping on the experience and expertise of its



Source: "Developing a Sustainable Air Hub in Singapore" via https://go.gov.sg/sustainableairhubsg

members, which include senior executives of global aviation bodies and key aviation companies. The recommendations covered three key domains of airport, airline and air traffic management.

(a) **Airport Domain.** The IAP recommended six initiatives to improve sustainability at Singapore's Changi Airport by switching to renewable energy and improving energy and resource efficiency. These include solar panel deployment on the airfield, transiting airside vehicles towards cleaner energy sources and exploring the potential for an onsite waste-to-energy facility to enhance resource circularity.

(b) **Airline Domain.** The IAP recommended five initiatives focussing on improving sustainability of airlines operating to, from and through Singapore. This includes investing in Sustainable Aviation Fuel (SAF) comprising the setting up of an entire ecosystem to make SAF viable. On the supply side, this includes identifying and sourcing for feedstock within the region. On the demand side, it will include setting-up a "Singapore / ASEAN Corporate Buyers' Club" as well as designing and introducing an offtake mechanism to create SAF demand signals.

(c) **Air Traffic Management Domain.** The IAP recommended four short- and medium-term initiatives to optimise air traffic management procedures and advance new concepts of operations in collaboration with regional partners and stakeholders. These would increase efficiency and reduce fuel burn and emissions, resulting in improved environmental performance and fuel savings. Recommendations were also made to improve the coordination and management of longer haul flights and implementing direct route operations for arrivals in Singapore on specific route segments, which would enable aircraft to fly more optimal and efficient routes.

(d) The IAP also recommended the development of four critical enablers that will undergird the 15 initiatives and provide the

right conditions for the effective implementation of these initiatives.

The recommendations of the IAP will be integrated into Singapore's Sustainable Air Hub Blueprint, to be published by CAAS in 2023. This will be a significant initiative which will help provide thought leadership and further catalyse investments, actions and collaborations with private sector companies and other countries.

The IAP report is accessible via the following link: https://go.gov.sg/sustainableairhubsg

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President, Singapore University of Technology and Design

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MRO ASIA-PACIFIC 2022

After a two-year hiatus, MRO Asia-Pacific 2022 returned with a bang from 20 to 22 September, drawing aerospace and aviation professionals from 67 countries keen to explore business opportunities with over 180 exhibitors

Aviation Week Network's MRO Asia-Pacific Conference and Exhibition, co-located with Aero-Engines Asia-Pacific was held in Singapore from 20 to 22 September 2022. The conference and exhibition brought together over 4,000 industry professionals. The event drew representatives from 67 countries and hosted a sold-out exhibition hall featuring more than 180 exhibitors.

The Conference featured 55 airline and industry speakers with sessions discussing regional recovery, geopolitical pressures, retaining talent, sustainability and more. The MRO Asia-Pacific exhibition hosted 188 exhibiting companies including pavilions representing Singapore, Malaysia, Queensland, Australia and Florida, USA. Attendees conducted business, signed contracts, and were pleased to have opportunities for face-to-face meetings and networking.

The Singapore Pavilion housed 27 exhibiting companies showcasing a diverse range of capabilities including aircraft ground support, components, distribution of aircraft parts and equipment, inspection and testing, MRO services etc. The pavilion attracted many visitors, potential partners and customers as fruitful discussions were observed at various booths.

Exhibitors were unanimous in noticing the high number and quality of trade visitors from airlines, MROs and other industry stakeholders. The next edition of MRO Asia Pacific Conference and Exhibition is slated to be held in Singapore from 26 to 28 September 2023.

Visitors learning about the latest products and service offerings at the Singapore Pavilion. Photo: Aerophotoworks for AAIS

Joshua Ng, Director at Alton Aviation Consultancy, presenting at the GoLive Theater. Photo: Aviation Week Network

Singapore Pavilion Exhibitors

Companies	Booth Number
ACME Manufacturing Company Pte Ltd	1001
AMS Decision Pte Ltd	1021
Applied Total Control Treatment Pte Ltd	1016
ATEQ Singapore Pte Ltd	1019
Auxitrol Weston Singapore Pte Ltd	810
Aviation Partner & Consulting Pte Ltd	903
Ban Chu Leong Technologies Pte Ltd	907
Bollore Logistics Singapore Pte Ltd	902
CBMM Supply Services & Solutions Pte Ltd	1009
Coway Engineering & Marketing Pte Ltd	808
CW Aero Services Pte Ltd	1007
Dviation-Transfingo Pte Ltd	909
Eezee Pte Ltd	1008
Field International Pte Ltd	913
Hypercoat Enterprises Pte Ltd	1002
Ipeco Singapore Pte Ltd	914
Magellan Singapore Pte Ltd	908
Ontic Engineering & Manufacturing Asia-Pacific Pte Ltd	804
Orapi Applied (S) Pte Ltd	802
Rhinestahl Singapore	915
Rieckermann (Singapore) Pte Ltd	1013
R.I.S.E Aerospace Pte Ltd	901
Saservo Pte Ltd	1020
Singapore Aero Engine Services Pte Ltd	816
Topcast Aviation Singapore Pte Ltd	920
VBC Pte Ltd	814
W.H.Brennan & Company Pte Ltd	1010

Coordinated by: Association of Aerospace Industries (Singapore)

Supported by: Enterprise Singapore

REGISTRATION OF UNMANNED AIRCRAFT IN SINGAPORE TOPS 17,000

The Civil Aviation Authority of Singapore (CAAS) implemented mandatory registration for Unmanned Aircraft (UA) with a total weight above 250 grams from 2 January 2020. This means that any UA including radio-controlled aircraft, drones and remote-controlled kites must be registered before they can be operated in Singapore. Aerospace Singapore takes a closer look at the data that has been collected by CAAS and what it means about UA development in Singapore.

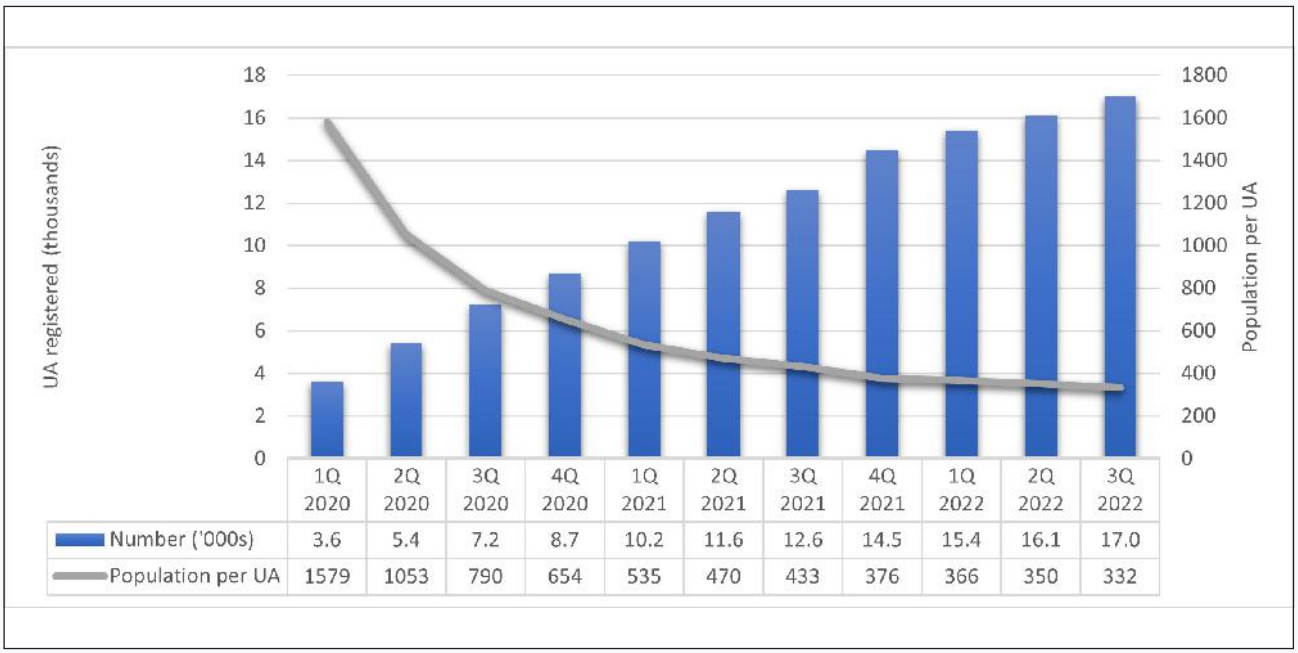
Since the first quarter of 2020, total net registrations of UA in Singapore have grown steadily, albeit at a declining rate. As of third quarter 2022, there were 17,000 UA registered with CAAS. From the initial new registrations of 1,800 UA per quarter, growth appears to have slowed in 2022 to about half, at 700 to 900 UA per quarter. These figures are illustrated in Chart 1.

As an indicator of the UA adoption or penetration rate, we compared the total UA registered against the total population in Singapore. This works out to be 332 people per UA. To make sense of this, we compared this figure against that of other countries – those known to have significant UA adoption. These countries also have similar mandatory requirements for registration of UA.

On a per capita basis, Singapore shares a high UA adoption rate - similar to USA, and half that of Switzerland and Germany. We also sampled data for China and Brazil, countries with a higher proportion of rural populations. Both clocked in at above 2,000 people per UA. This is illustrated in Chart 2.

The adoption rate in Singapore is surprisingly high given that we have significant constraints to flying of UA due to limited space. One can pass a whole day without sighting a UA, unless one is near an official or unofficial public UA flying area such as Pandan Reservoir or old Holland Road. It is all

Chart 1: UA Registration in Singapore / Population per UA



	1Q 2020	2Q 2020	3Q 2020	4Q 2020	1Q 2021	2Q 2021	3Q 2021	4Q 2021	1Q 2022	2Q 2022	3Q 2022
Number ('000s)	3.6	5.4	7.2	8.7	10.2	11.6	12.6	14.5	15.4	16.1	17.0
Population per UA	1579	1053	790	654	535	470	433	376	366	350	332

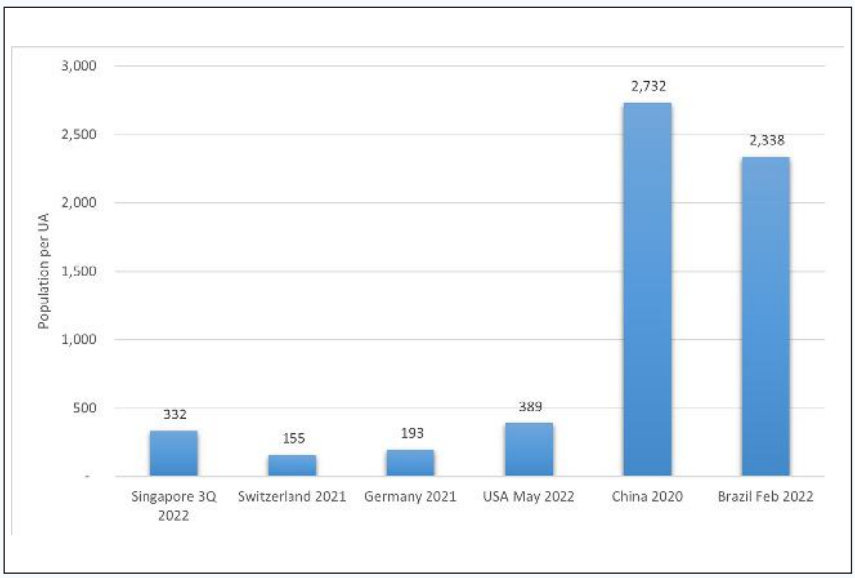
Notes: Data from CAAS and Singapore Statistics

the more surprising when you consider Singapore's modest land area of 718 square-kilometres, meaning that there are 21 registered UA per square-kilometre!

The registration process for UA in Singapore involves the purchase of a registration label (S$15) – online or at designated post offices – followed by the completion of the UA registration online. Singaporeans and Permanent Residents are allowed to purchase up to five registration labels each while other individuals are only allowed to purchase one label. Registrants must be 16 years old and above.

It is an offence to operate an unregistered UA with a total weight of above 250 grams in Singapore. Offenders could face a fine of up to $10,000, or imprisonment not exceeding 6 months, or both.

Chart 2: Comparison of UA Density by Country



Notes: UA registration figures from public sources, total population from World Bank 2021 data. Singapore 2022 data from CAAS and Singapore Statistics.

PAYA LEBAR: MODERN AVIATION TAKES OFF IN SINGAPORE

Once heralded as the best equipped and most modern airport of all Asia, Paya Lebar Airport has seen eras come and go but remains a valuable part of the Singapore aviation heritage. Repurposed as a military airbase in 1981, the site will continue its transformation in the 2030s with plans to convert the 800ha area into a new generation town with 150,000 homes, workplaces, amenities and recreational areas. In this essay commissioned by *Aerospace Singapore*, aviation historian Goh Yong Kiat describes the development of Paya Lebar Airport and its significance in establishing Singapore as the innovative air hub of today.

On 20th August 1955, Singapore's new airport at Paya Lebar was officially opened by Colonial Secretary, Mr. Alan Lennox-Boyd, to pomp, pageantry, and some 10,000 people in attendance.

This is where the notion of Singapore as an aviation hub took off. A single runway, 8,000ft (2,438m) long and 200ft (61m) wide, with its associated taxi-tracks and aprons, allowed Paya Lebar to handle the biggest and fastest airliners that were coming into commercial airline service at that time.

To meet the immediate needs of the growing passenger traffic, a temporary passenger terminal was constructed. In the plans, however, was a larger permanent terminal building with the conveniences and comforts of a modern international airport with shopping facilities, restaurants, bars, banks, etc. In view of this, the temporary terminal building was constructed such that it could easily be converted later to workshops, stores and offices when the permanent terminal was commissioned.

Paya Lebar marked a new era for transportation and the dawn of the jet age. In June 1959, BOAC began Comet 4 jet service between London and Singapore. In August the same year, the first Boeing jet arrived. A Qantas Boeing 707 arrived from Bangkok after two hours eight minutes of flight, the fastest recorded by any civil airliner flying on this route.

A distinctive feature of Paya Lebar International Airport was the mosaic wall mural located on the second floor of the terminal building. On the first floor of the building were several shops and the Overseas Chinese Bank. Photo: Ministry of Information and the Arts Collection, courtesy of National Archives of Singapore

Into the Jet Age

Larger and faster aircraft continued to enter service with various airlines through the late 1950s and 60s. This made air travel more economical and within the reach of the wider public. As a result, the volume of air traffic into Singapore almost doubled every five years at the time.

By early 1960s, Paya Lebar Airport was handling about 300,000 passengers with over 30,000 aircraft movements recorded in a year. This rapid growth generated problems, especially in dealing with air and ground traffic during peak hours. Peak hour traffic, for example, caused "stacking" of aircraft above Paya Lebar airspace due to the lack of parking bays. This was further aggravated by the increasing capacity of aircraft resulting in longer turn-around time.

On the ground, the temporary passenger terminal was bursting at its seams. High volume passenger traffic and bottlenecks at customs and immigration clearance became frequent occurrences. Peak hour congestion was

not confined to the passenger terminal alone, ground vehicular movements at the apron became hectic and outside the terminal, car parks overflowed.

Fortunately, improvements to the airport infrastructure were already underway. The runway was extended by 1,000 feet and was operational in February 1962, making it one of the longest civil runways in Southeast Asia. Construction of a jet apron to expand the capacity of parking bays started in January that year, and the erection of a new passenger terminal building also commenced at about the same time.

Photograph of Paya Lebar Airport with the new passenger terminal building (foreground) which was officially opened on 2 May 1964. Photo: RAFSA Collection, courtesy of National Archives of Singapore

Meeting the Growth

1963 saw the completion of these and other major projects which positioned Paya Lebar Airport as a modern and progressive international airport. Further improvements were undertaken including the installation of a surveillance radar which became operational in 1964. This provided enhanced air traffic services and safety in expediting the flow of traffic operating within the congested Singapore terminal area, immediate airspace and beyond.

In the first six months of 1965, three more new airlines were added to the list of scheduled flights into Singapore. They were Lufthansa German airlines with Boeing 720s, Air Vietnam with Caravelles and UTA French airlines with DC-8s. BOAC also inaugurated its new VC-10 service and increased its scheduled flights. In February, an Air New Zealand DC-8 flew 5,385 miles from Singapore to Auckland after a nine-day proving programme in the Orient. This was the first direct flight from Asia to New Zealand.

With its excellent airport infrastructure and in the crossroads of airlines' routes, Singapore enjoyed the favoured position as the focal point for air traffic in the region. By the end of 1965, the year Singapore emerged as an independent nation, aircraft movements at Paya Lebar Airport reached 47,551. Passenger traffic had increased to 705,483, a rise of approximately 16% over the previous year.

Meanwhile, improvements to Paya Lebar Airport continued. The runway received the Instrument Landing System (ILS) and was extended to 11,000 feet in 1968. Construction work started on the extension of airline ticketing offices and a flower fountain on the traffic circus facing the terminal building.

Stretched to Its Limit

The following years saw a rapid increase in number and types of jet aircraft such as the Boeing 747 jumbo jet in 1971 and the supersonic Concorde in 1972. By early 1970s, Paya Lebar's facilities were again stretched to its limit. Even as it dealt with the continuous increase in passenger traffic, the airport infrastructure also had to

(Left) A Lockheed 12 in 1966 and (right) Boeing 307 in 1967 at Paya Lebar Airport. Photos: From the Collection of Charles M. Daniels via the San Diego Air and Space Museum Archive on The Commons on Flickr

A Malaysia–Singapore Airlines (predecessor of Singapore Airlines and Malaysia Airlines) Boeing 737 at Paya Lebar Airport circa 1969-1971. Photo: NSBReynolds, CC BY-SA 4.0 via Wikimedia Commons

be continually upgraded to cope with new aircraft types, in particular the large capacity wide-bodied aircraft such as the Boeing 747, McDonnel Douglas DC-10 and the Lockheed Tristar.

In a period of less than 20 years, passenger movements in Singapore had multiplied six folds. By 1971, 1.8 million passengers were using the facilities at Paya Lebar annually. In that year, as many people used Paya Lebar Airport, as there were living in Singapore!

With a single runway, it was estimated that the airport would only be able to cope with traffic growth up to 1980. A second runway was needed. Feasibility studies on expanding Paya Lebar revealed many physical difficulties such the swampy nature of parts of the terrain which required drainage as well as the resettlement of affected inhabitants. The plans would also inhibit the development of the airport's surrounding areas. An alternative site had to be found, without these encumbrances to maintain Singapore's status and attractiveness as an air hub.

Commemorative stamp issued in 1991 featuring Paya Lebar Airport and the Concorde. Source: Unknown

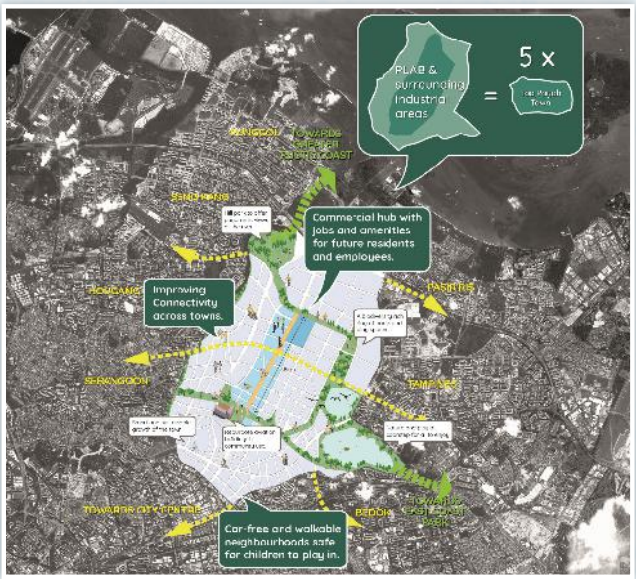
A new airport to replace Paya Lebar

In June 1975, announcements were made that the military airbase at Changi would be developed into a new international airport to replace Paya Lebar Airport.

In preparation for the transfer of airport operations to Changi, one of the biggest "house-moving" operations Singapore had ever seen took place over three nights from 29th June 1981. More than 2,200 aircraft servicing equipment and at least 1,000 airport personnel were involved in the shift from Paya Lebar Airport to the new Singapore Changi Airport. Some roads were closed for the long convoys of airport vehicles, from five-ton aircraft tow tractors to six-metre-wide main deck low-loaders. 30th June was a crucial night when the bulk of the aircraft ground servicing equipment scattered all over Paya Lebar was moved along the 20km route to Changi Airport.

While the last commercial flight was dispatched out from Paya Lebar Airport on the night of 30th June, preparations by the Republic of Singapore Airforce (RSAF) were underway to move their Changi-based squadrons over to Paya Lebar the next day. Thus, simultaneously on 1st July, while Changi Airport started operations, the RSAF flew their aircraft from the Flying Training School in Changi, into its new home at Paya Lebar Airport.

Singapore's second airport was renamed Paya Lebar Air Base on 1st July 1993. It will continue to serve as a military base until 2030, when the 800 ha of land it sits on will be returned to the state and repurposed for housing and industrial use.



The Urban Redevelopment Authority of Singapore has called for ideas to "co-vision a community of the future" with the Paya Lebar Airbase site slated to undergo transformation for 2030s onwards. Image: URA

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Singapore University of Social Sciences (SUSS) is a university with a rich heritage in inspiring lifelong education and transforming society through social sciences. We develop work-ready graduates and work-adaptive alumni to their fullest potential through our 3H's education philosophy – 'Head' for professional competency with applied knowledge, 'Heart' for social awareness of the needs of the society, and 'Habit' for passion towards lifelong learning. The university offers more than 80 undergraduate and graduate programmes, available in full- and part-time study modes which are flexible, modular and inter-disciplinary, catering to both fresh school leavers and adult learners. To date, over 42,000 graduates have experienced SUSS' unique brand of education and each year, over 17,000 students are pursuing their full- and part-time studies with the university. Eligible students taking SUSS undergraduate programmes enjoy government tuition grants or subsidies, and have access to financial assistance schemes including scholarships, bursaries and tuition fee loans.

About School of Science and Technology
The School of Science and Technology (SST) is multidisciplinary in nature and offers a wide range of degree programmes that includes Infocomm Technology, Digital Media, Aerospace Systems, Biomedical Engineering, Electronics Engineering, Human Factors, Facilities and Events Management, Building and Project Management, and Mathematics. The combination of high-quality curricula and dedicated teaching staff offers students a well-rounded education that enhances their knowledge and learning in science and technology, as well as provide them with greater opportunities to develop intellectually and professionally and expand their range of career paths.

BEng Aerospace Systems
The SST's Bachelor of Engineering Aerospace Systems is accredited by the Engineering Accreditation Board (EAB), Institution of Engineers Singapore (IES). Through this accreditation the BEng Aerospace Systems is recognized internationally following the Washington Accord.

The BEHAS programme provides a firm grounding in aerospace engineering (material, structure, aerodynamics, control, propulsion, design), avionics systems and aviation management. It is designed for individuals aspiring to excel in the aerospace industry as well as for those who are keen on enhancing knowledge, skills and understanding of aviation. Rigorous academic training in analytical, computational and system design skills also enables our graduates to find their career path in non-aerospace industries such as robotics, ground transportation, automotive, mechatronics, and software companies.

Our approach towards education has always hinged on the philosophy of "learn today, apply tomorrow". And this is only possible because our teaching staff are in touch with the cutting edge of the industry. We collaborate with industry and engage many of their senior management to develop and teach in our courses, exposing the students to the best practices in the industry within the classroom.

In addition, our partnership with a world renowned aerospace academic institution, Cranfield University, together with our local industry partners such as ST Engineering Aerospace and Republic of Singapore Air Force ensures that our curriculum stays relevant to the industry.

A Primer on Aerospace and Aviation at Cranfield University, U.K.
This five-day, full-time course conducted in Cranfield University is a unique course embedded in our programme which essentially provides a level of exposure not commonly featured elsewhere: Students take flight laboratory in an airplane to learn how to evaluate flight performance and dynamics. The curriculum of this imitable programme also includes structural integrity, wind tunnel testing, airport operations, accident and emergency handling, and air accident investigation, all taught by renowned academic staff from Cranfield University.

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SUSS
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NICOLETTE PANG
BEng Aerospace Systems

AEROSPACE TECHNOLOGIES OF THE FUTURE

AAIS, Boeing and the Singapore Energy Centre were proud to organize the "Aerospace Technologies of the Future" workshop at NUSS Kent Ridge Guild House on 30 August 2022. Centered around the theme of sustainable aviation, the workshop welcomed experts and professionals from the aviation industry, public sector, and academia to discuss efforts and challenges of decarbonizing aviation, including future aircraft concepts, and renewable energies. The hybrid event received overwhelming response with physical seats oversubscribed.

The workshop kicked off with opening remarks from AAIS President Wong Yue Jeen, followed by eye-opening presentations by Keynote speakers. Chief Sustainability Officer for the Civil Aviation Authority of Singapore (CAAS) Daniel Ng spoke on the progress of the Sustainable Air Hub Blueprint for Singapore, highlighting measures and policies being adopted to reduce energy consumption and deploy renewable energy at Changi airhub. Michael Edwards, Senior Director of Boeing Research & Technology Asia Pacific then presented insights on "What is currently changing in Aerospace?", providing updates on next-generation technologies at Boeing.

Overwhelming interest from industry saw physical seats at the event oversubscribed

Following this, Director of eVTOL Research and Innovation Centre at NTU, Professor James Wang, painted a vision of an exciting future in the next 20 years for eVTOL aircraft and the air taxi ecosystem. Director of CSIRO Futures, James Deverell rounded off the presentations with a sharing on technologies being developed towards decarbonising the aviation sector in the coming years.

Speakers and panellists of the "Aerospace Technologies of the Future" workshop with AAIS President Wong Yue Jeen (bottom, second from left)

Guests soaking up the opportunity to network face-to-face to further discussions on sustainability

In the second half of the session, a panel discussion was held, featuring speakers from industry and academia. Panellists included Professor Liu Bin, Senior Vice Provost at NUS; Professor Sameer Alam, Deputy Director of Air Traffic Management Research Institute at NTU; Jacqueline Lam, Regional Lead, Global Sustainability Policy and Partnerships at Boeing International and Dr Ho Chaw Sing, CEO of the National Additive Manufacturing Innovation Cluster in Singapore. Moderated by Arun Mulay, Boeing Fellow at The Boeing Company, the panel took questions from the physical and online audience and had robust discussions on the progress of sustainable aviation, the use of hydrogen, air traffic management and Sustainable Aviation Fuels (SAFs).

Guests in attendance also took the opportunity to network during the coffee break and lunch reception after the workshop. It was heartening to have stakeholders coming together to discuss a greener, brighter, and more exciting future for aviation and aerospace! AAIS thanks all speakers and panellists for a very fruitful session, as well as Boeing and Singapore Energy Centre for the partnership and event arrangements.

URBAN AIR MOBILITY ROUNDTABLE

AAIS, ITE and Volocopter were proud to jointly organise the first Urban Air Mobility (UAM) Roundtable in Singapore on 13 July 2022. Held at ITE College Central, the event brought together UAM professionals and government representatives to discuss the development of the UAM ecosystem and business opportunities in the region. The in-person event drew the attention of aerospace professionals from across the sector, with seats oversubscribed.

The session kicked off with a welcome by AAIS President Wong Yue Jeen and Opening Remarks by Chu Hon Lung, Head of APAC at Volocopter. This was followed by stimulating presentations by Volocopter CCO Christian Bauer on the Roadmap to Launching UAM, and Skyports Head of APAC Tay Yun-Yuan on UAM Infrastructure. A robust panel discussion ensued, featuring speakers from leading UAM organisations including Augustine Tai, Business Development Lead (APAC) at Eve Air Mobility; Derek Cheng, Head of Commercial Asia-Pacific at Vertical Aerospace; as well as Volocopter's Chief Risk & Certification Officer Oliver Reinhardt and CCO Christian Bauer. Moderated by AAIS Panel of Expert member Robin Thevathasan, panellists also included government representatives Tan Chun Wei, Director Unmanned Systems Technology & Partnership at the Civil Aviation Authority of Singapore; and Ethan Lim, Assistant Vice President, Strategy Group (Mobility) at the Singapore Economic Development Board.

AAIS Panel of Expert member Robin Thevathasan (extreme left) moderating the panel at the UAM Roundtable

Guests at the event also had the opportunity to visit the VoloCity Exhibition for a guided tour, which was followed by a networking lunch reception. The VoloCity showcase features the company's commercial air taxi model in Asia, and is Volocopter's first long-term exhibition to open its doors to the public anywhere in the world. The public can experience the aircraft in person and learn about its future services and potential.

ASEAN AIR TRANSPORT WORKING GROUP SUSTAINABILITY FORUM

AAIS members participated in a Sustainability Forum held in association with the 46th ASEAN Air Transport Working Group meetings from 12 to 15 September 2022. The forum, which took place on 14 September at the Grand Copthorne Waterfront Singapore saw AAIS members participating as industry observers in-person and online. The forum focused on airport sustainability and sustainable aviation fuel (SAF), with speakers from the region sharing their experiences in the implementation of sustainability practices in airports.

Delegates and AAIS members (observers) in attendance at the ASEAN ATWG Sustainability Forum

The session kicked off with opening remarks by Mr Daniel Ng, Chief Sustainability Officer at the Civil Aviation Authority of Singapore (CAAS). This was followed by a presentation by Airports Council International Asia-Pacific covering the Airport Carbon Accreditation programme and best practices in green airport infrastructure. Following that, representatives from Hong Kong International Airport (China) and Iloilo Airport (the Philippines) joined the session virtually to share on the Environmental Management Systems (EMS) that have been implemented on their sites towards achieving carbon reduction targets

The second part of the programme featured a presentation on the EMS and sustainability practices at Changi Airport. Some insights were shared about the SAF pilot project in Singapore and Changi Airport's facilitation process behind SAF deployment. Participants also heard from the Roundtable on Sustainable Biomaterials which gave a high-level briefing on the findings of its recent SAF report.

We thank CAAS for providing the opportunity for industry members to partake in this important regional forum.

ICCAIA ASIA BRIEFING SUMMER EDITION 2022 – SUSTAINABILITY

AAIS was pleased to organise the ICCAIA (International Coordinating Council of Aerospace Industries) Asia Briefing Summer Edition 2022, together with the Society of Japan Aerospace Companies (SJAC) and Malaysia Aerospace Industry Association (MAIA). Held on 25 August 2022, the webinar focused on environment and sustainability with speakers from across the aviation sector presenting information and giving views on the political landscape, technical solutions, and issues of industry concern.

Following welcome remarks from AAIS, MAIA and SJAC representatives, the Permanent Representative of ICCAIA to the International Civil Aviation Organisation (ICAO), Dan Carnelly, presented an overview of the net-zero carbon emissions goal for aviation, highlighting challenges and sustainability issues for Asia region. This was followed by a briefing and updates by Haldane Dodd, Executive Director of Air Transport Action Group, on the developments of global policies being pursued on CORSIA and the recently released report for a long-term global aspirational goal (LTAG) for international aviation published by the Committee on Aviation Environmental Protection (CAEP).

Dr Eric Upton, Chairman at ICCAIA Aircraft Noise and Emissions Committee, then shared on ICCAIA's contributions to CAEP and technical challenges for a new Joint Noise and CO2 Standard which calls for dual stringency. Rounding off the presentations, Sami Jauhiainen, Vice President of APAC at Neste Asia Pacific spoke on Sustainable Aviation Fuels, providing insights on the market outlook for SAFs and opportunities in Singapore and the Asia-Pacific region.

Speakers of the ICCAIA Summer briefing 2022

Following the presentations, participants engaged in robust discussions with the speakers, bringing up questions on the availability of sustainable biomaterial feedstock for SAF supply, alternative pathways to SAF, the future for supersonic commercial flights given the intensity in sustainability, as well as the potential impact and responses for developed countries in Asia in meeting CORSIA and LTAG.

THE EASA ARTIFICIAL INTELLIGENCE ROADMAP: TOWARDS AI TRUSTWORTHINESS

Artificial Intelligence, and more specifically machine/deep learning, opens up promising prospects for many areas of aviation. However, it raises the crucial question of the level of confidence that can be placed in these techniques when used in safety-critical applications and their compatibility with strict certification requirements.

In February 2020, the European Union Aviation Safety Agency (EASA) published its roadmap to accompany the deployment of AI in aviation which was followed by a concept paper released in April 2021 providing 'first usable guidance for Level 1 machine learning applications'. These papers have been published anticipating future EASA guidance and requirements for AI/ML applications.

In this in-person seminar jointly organised by AAIS and the EASA office in Singapore, Guillaume Soudain, EASA AI Programme Manager together with Francois Triboulet, ATM/ANS Expert at EASA, outlined the main elements of the EASA AI roadmap. Their presentation elucidated the key elements of this first guidance and outlined several remaining challenges with respect to AI trustworthiness. The speakers also took questions from the audience relating to the development of the AI standards for aviation, AI-based system interaction with humans, learning assurances and others.

Guillaume Soudain and Francois Triboulet of EASA briefing participants on the regulator's AI Roadmap

Held on 19 September 2022 at the AAIS premises in Seletar, this seminar saw a full house with the participation of aviation and aerospace professionals from across various sectors.

AEROSPACE PARTNERS' GOLF TOURNAMENT 2022

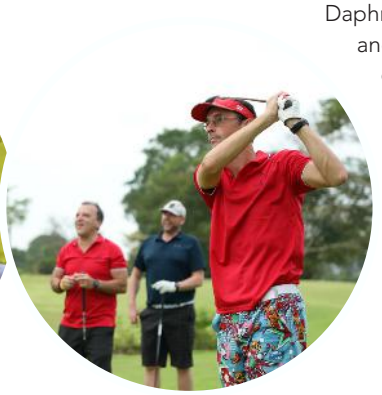
AAIS was proud to co-organise the Aerospace Partners' Golf Tournament 2022 on 9 September, with the participation of over 80 golfers from the aerospace industry. Continuing a more than two-decade-old tradition, APGT 2022 once again demonstrated the aerospace community's longstanding support for the Cerebral Palsy Alliance Singapore (CPAS).

With the easing of pandemic restrictions, bright smiles and interactions between participants were a welcome sight at Tanah Merah Country Club Garden Course. Despite the downpour during registration and lunch, spirits remained high as participants took the time to reconnect and catch up in a warm atmosphere. Shortly after, the rain subsided, and the golfers enjoyed great games in cool weather. Roving buggies were activated to ensure a continuous supply of beer, 100-Plus, bananas and chocolate bars for participants in between strokes.

Back in Full Swing – Players in high spirits before the shotgun start

The evening programme included a wine tasting session, performances by the boy's brigade, Daphne & Company, and networking dinner. One of the highlights was a charity art auction, featuring unique artworks by the beneficiaries of CPAS. The dinner concluded with a prize presentation for the tournament and an exciting Raffle draw, where lucky winners walked away with attractive prizes.

It was a meaningful day of sportsmanship, philanthropy and networking for participating industry members. All net proceeds from the event will be donated to CPAS.



Golf Tournament Winners

Champion:	Yip Ying Kiong	36 points ocb (11)
1st Runner Up:	Geoffrey Grier	36 points ocb (5)
2nd Runner Up:	Kenny Yap	36 points (11)
Team Champions:	Team Airbus 2 Geoffrey Grier Marius Fratiou James Bower Chong Jun Wen	100 points
Novelty Games		
Nearest to the pin (Individual):	Om Prakash Yadav	
Nearest to the pin (Team):	Team AAR Rahul Shah Andy Tang Monty Richardson Gonzaloa Salaxar	

SINGAPORE UAS COMMUNITY NETWORKING

The Singapore UAS Community was excited to hold its first in-person networking event on 4 October 2022 at Brewerkz, Orchard Rendezvous Hotel. Organised in partnership with Montgomery Asia and Drones Asia 2023, the event attracted more than 40 participants. We were also delighted and honoured to welcome senior management of Montgomery Group and Montgomery Asia, as well as officers from the Civil Aviation Authority of Singapore and Enterprise Singapore.

Following great conversations and bonding with new friends over beer and bites, the evening was capped off with a lucky draw graced by Mr Rupert Owen, co-founder of GeoConnect Asia and Drones Asia. Three lucky members each won either a bottle of wine (courtesy of AAIS) or a Drone Security course bundle (compliments of DroneSec).

SAQG WORKSHOP: CHANGES IN EASA PART 145

AAIS held an in-person workshop on the new EASA Part 145 Safety Management System (SMS) regulations on 4 August 2022 conducted by Luigi Preti, Maintenance Organisation Expert and EASA International Officer in Singapore. The session had a strong turnout, gathering more than 80 aerospace professionals at the AAIS premises in Seletar.

During the workshop, Luigi informed participants on the new regulation updates and highlighted what their next steps are under the new EASA Part 145. He also shared about the SMS Industry Standard comprising of four major components – safety policy and objectives, safety risk management, safety assurance and safety promotion.

This can help organizations implement and improve their SMS, enabling them with a more effective information sharing process and continued airworthiness.

Companies or quality representatives keen to have a deeper understanding of or contribute to aerospace standards matters are welcome to contact us (quality@aais.org.sg) to be part of the Singapore Aerospace Quality Group (SAQG).

Strong turn out at the first in-person SAQG event after nearly 2 years of virtual events

Luigi Preti of EASA in Singapore, briefing the quality community on critical updates

ADVANCED MANUFACTURING LEARNING JOURNEY

Advanced manufacturing has become a key industry buzzword as companies seek to undergo transformation with the aim of developing better capabilities, adaptivity and productivity along the supply chain.

An Advanced Manufacturing Learning Journey (AMLJ), held on 23 September 2022, was organised by AAIS to provide members and industry participants an opportunity to experience the transformative possibilities of advanced manufacturing technologies.

Located within Singapore Polytechnic, the AMLJ co-developed by SP and TÜV SÜD, brought participants on an interactive tour through 3 distinct zones – namely the Digitalisation, Integrated, and Smart zones. Through the learning journey, a host of solutions were shared, including automation, sensors and IOT, and decision-making tools to increase productivity on the shop floor. The learning journey also included presentations covering success stories of digital transformation on shopfloors, inspiring participants to kickstart their own transformation processes.

Participants got a taste of the possibilities with transformative technologies

On behalf of members and participants, we thank our hosts -ASTech, Smart i4.0 Transformation Alliance (SiTA) and Singapore Polytechnic – for a constructive afternoon.

VIRTUAL B2B MEETINGS: SINGAPORE AND MALAYSIA AEROSPACE COMPANIES

In collaboration with the Malaysia Aerospace Industry Association (MAIA), AAIS organised a virtual Business-to-Business (B2B) meeting programme on 7 July 2022. The event sought to provide members from both organisations with a platform to explore the regional aerospace and aviation market, as well as opportunities for synergy, collaboration and business ventures.

The morning programme saw an opening address by AAIS President Wong Yue Jeen, as well as welcome remarks by CEO of Invest Selangor Berhad Dato Hasan Azhari Hj Idris.

This was followed by a presentation on "The Need for Defining Supply Chain Competitiveness in a Post COVID Era" by Naguib Mohd Nor, President of MAIA. The speeches and presentation kicked off a day-long virtual B2B programme that drew interest from a total of 75 Singapore and Malaysia aerospace companies, with more than 50 companies exchanging profiles.

HOW COVID AND CONFLICT IN UKRAINE HAS AFFECTED AIRCRAFT LEASING

Even before we bid goodbye to the pandemic, a new crisis has arisen in the form of the Russia-Ukraine conflict. More than 500 western-made leased aircraft were affected by sanctions against Russia by the end of March 2022. To address the topic of "How COVID and Conflict in Ukraine has affected Aircraft Leasing", AAIS were pleased to organise a webinar on 23 June 2022 with distinguished speakers from Cirium and RHT Law. The session provided insights on how aircraft leasing has weathered the pandemic and is dealing with the fallout from the war in Europe.

The webinar kicked off with a presentation from Mr Rob Morris, Global Head of Consultancy at Ascend by Cirium, who gave an assessment on the current market outlook, the impacts of sanctions on Russian-leased aircraft fleet as well as the progress and challenges to recovery efforts by lessors. Rob also shared his views on the repercussions for lease rates and touched on the impact of the conflict on the ongoing recovery of the commercial aviation sector in Europe and globally.

Next, Mr Rajaram Ramiah, Partner at RHT Law LLP, shared his views on the legal repercussions of international sanctions and suspension of airworthiness certificates on aircraft operating in Russia, as well as the policy responses from the Russian government. He also highlighted the complexities of insurance covers and claims for lessors as policyholders, given the unusual circumstances.

Clockwise from top right: Mr Rob Morris of Ascend by Cirium,and Mr Rajaram Ramiah of RHT Law with Mr Sia Kheng Yok(CE, AAIS), host and moderator of the session.

Participants of the webinar took away good insights on the impact of sanctions on Russian-leased fleets, the significance of the conflict with respect to global air travel recovery, and other uncertainties arising from a resurgence of COVID and other macroeconomic risks. We thank our senior expert speakers for their time and perspectives.

CYBERSECURITY RESILIENCE IN AVIATION

Civil aviation is reliant on cyber technology to enable the safety and efficiency of air transport. It uses interconnected systems for air navigation, onboard aircraft control and communications, airport ground control, flight information, security screening and many other daily operations.

The interconnection of aviation systems across geographic locations means that cyber threats to aviation are global. Therefore, addressing cybersecurity needs to be addressed in a unified way by the entire aviation industry.

With concerns over the increasing risks of cybercrimes worldwide, we were pleased to present a seminar on the topic of 'Cybersecurity Resilience in Aviation' with Mr Gerry Ngu, a senior expert in aviation cybersecurity. Gerry is currently the Technical Lead of the European Cybersecurity Centre for Aviation and Chairman of the recently established Network of Cybersecurity Analysts for the European Member States. The event attracted aerospace professionals from across the different subsectors. This in-person seminar was co-organised by AAIS and the European Union Aviation Safety Agency (EASA) office in Singapore, and held on AAIS premises in Seletar on 29 June 2022.

AAIS GUEST BOOK

The Association of Aerospace Industries (Singapore) is delighted to once again be receiving international delegations, with the lifting of travel restrictions in April 2022. The visits provide opportunities for us to share about the status of the Singapore aviation and aerospace industries and Seletar Aerospace Park, find out about aerospace industry developments in the visitors' countries and regions, as well as discuss opportunities for international business collaboration. Here are some recent highlights:

Center for Aviation Competence (Switzerland)

15 June 2022

One of the first visitors we received after the long lull was by a group of MBA students from the Center for Aviation Competence, an independent institution under the University of St Gallen. The visit was made as part of an overseas leg of the MBA programme, which included lectures and company visits in Singapore. AAIS provided a briefing on the aviation and aerospace industries in Singapore and the region.

Korea Aerospace Industries Association (Republic of Korea)

21 June 2022

AAIS was pleased to welcome counterparts from the Republic of Korea led by Mr Min Seon Ki, Director at KAIA. Both parties took the opportunity to give updates on the development of their respective aerospace industries. KAIA touched on their ongoing aircraft programmes including the IAI B777 P2F, and noted the intention of the Korean government to expand its domestic MRO market to 5 trillion KRW by 2030.

Timor-Leste Vice-Minister of Trade and Industry (Timor-Leste)

1 September 2022

His Excellency Domingos Lopes Antunes, Vice-Minister of Trade and Industry of Timor-Leste visited SAP accompanied by senior officials from the Timor-Leste External Trade and Customs divisions. During their visit, the delegation was briefed on SAP and developments in the Singapore aviation and aerospace industries. The delegation also shared the prospects of developing an aviation industry to support tourism in Timor-Leste.

Queensland Aerospace and Aviation Delegation (Australia)

19 September 2022

AAIS received a delegation of visitors from Queensland, Australia, at the SAP. The visit was arranged by the Trade and Investment Queensland office in Singapore for companies participating in the MRO Asia-Pacific exhibition. AAIS Chief Executive provided a briefing on the Asian MRO Landscape. The delegation also met with AAIS members and exhibitors from the Singapore pavilion and visited companies in the SAP.

OUR NEW MEMBERS

ORDINARY MEMBERSHIP
Dedienne Aerospace Pte Ltd

Dedienne Aerospace is a family-owned company with over 70 years of experience in design and manufacturing of aerospace tooling and GSE.
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ORDINARY MEMBERSHIP
GE Aviation, Engine Services - Singapore Pte Ltd

GE Aviation has been in Singapore for the last 40 years. We provide a full range of component repair services for the GE and CFM commercial jet engines in our two plants at the Loyang Industrial Park. We have a third facility at Seletar Aerospace Park manufacturing new components for the GE90 and GE9X engines.

ASSOCIATE MEMBERSHIP
Cornerstone Global Partners Pte Ltd

Cornerstone Global Partners (CGP) was established in 2012 and is one of the largest recruitment solutions with 15 offices worldwide, spanning across China, Singapore, Hong Kong, Japan, and the United States delivering executive search, contracting, recruitment process outsourcing (RPO), and human resources outsourcing services to aerospace and aviation companies.

ASSOCIATE MEMBERSHIP
LNRS Data Services Pte Ltd (Cirium)

Cirium brings together powerful data and analytics to keep the world moving. Delivering insight, built from decades of experience in the sector, enabling travel companies, aircraft manufacturers, airports, airlines and financial institutions, among others, to make logical and informed decisions which shape the future of travel. Cirium is part of RELX, a global provider of information-based analytics.

UPCOMING EXHIBITIONS/ TRADESHOWS

INTER AIRPORT SOUTHEAST ASIA 2023

1 – 3 MARCH 2023

MARINA BAY SANDS, SINGAPORE

Covering all areas of airport-related technology, equipment, and services, inter airport Southeast Asia (IASEA) 2023 is your gateway to Asian airports and stakeholders. Be a part of the Singapore Pavilion and present solutions to some of Asia's most influential executives in the airport ecosystem, through face-to-face interactions that provide insights into trends shaping the future of Asia's airports.

DRONES ASIA 2023

15 – 16 MARCH 2023

MARINA BAY SANDS, SINGAPORE

The inaugural Drones Asia (DA) event is co-located with Geo Connect Asia and Digital Construction Asia. DA 2023 provides a focused meeting place for the region's UAV industries. In addition to the focus on providing integrated geospatial applications for key sectors across Southeast Asia, the event will incorporate the latest in aerial, unmanned and ground-based solutions.

Association of Aerospace Industries (Singapore)

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Association of Aerospace Industries (Singapore)

Feature prominently in the Singapore Aerospace Suppliers Directory 2023

- A biennial publication, the Singapore Aerospace Suppliers Directory (SASD) is the only Singapore publication that offers an unrivalled marketing platform for aerospace companies and aerospace related products & services suppliers.
- The directory features a comprehensive listing of aerospace suppliers registered in Singapore including distributors of aircraft parts equipment, components, fuels lubricants, toolings, and providers of special processes including precision machining, heat treatment, inspection & testing, surface treatment and peening.
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