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AEROSPACE

SINGAPORE

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BUZZING CITY:

Developing UAS in Urban Singapore

~ INSIDE ~
SINGAPORE PAVILION
@ SINGAPORE AIRSHOW 2022
SPECIAL SUPPLEMENT

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MESSAGE

WINDS OF RECOVERY

The Aviation and Aerospace industry enters 2022 on a note of optimism. Air cargo has recovered and domestic air travel around the world is on the path of recovery. In Singapore, the Vaccinated Travel Lanes have spurred demand for international travel and Singapore Airlines posted a record performance since the pandemic began, with over half a million passengers carried in December 2021 and a 50% overall load factor.

It is all relative of course, and the industry remains vulnerable to travel restrictions arising from new waves of COVID-19 variants like Omicron. Nevertheless, the Singapore aerospace industry is posting strong growth compared to the year before. The Economic Development Board reported that the sector grew 58.9% year-on-year in December 2021, and companies have commenced recruiting to meet fresh business demand.

As I pen this, the Singapore Airshow 2022 is just around the corner. In preparing for the Airshow, I notice a couple of changes. The Association of Aerospace Industries (Singapore) is once again coordinating the Singapore Pavilion to showcase SMEs and we are pleasantly surprised to see a significant proportion of first-time exhibitors. Perhaps this reflects how the pandemic has spurred industry restructuring and renewal. Another observation is that many events and meeting arrangements are being left to the latest possible moment. This perhaps suggests that we have learnt to become nimbler and adjusted to rapid changes and risk.

On this note of silver linings, I wish one and all a fruitful time at the Singapore Airshow and a brighter year ahead!

WONG YUE JEEN / AAIS President

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UK AND JAPAN TO JOINTLY DEVELOP NEXT-GENERATION FIGHTER ENGINE

The United Kingdom (UK) and Japan are joining forces to develop an engine demonstrator capable of powering separate sixth-generation fighters being pursued by both nations. Work on the joint engine demonstrator will kickstart in early 2022, according to an official press release by the UK Ministry of Defence (MOD) on 22 December 2021.

The engine development work will be led by industry from the two countries, including Mitsubishi Heavy Industries (MHI) and IHI in Japan, and Rolls-Royce and BAE Systems in the UK. The UK government is investing an initial £30 million (S$55 million) in planning, digital designs, and innovative manufacturing developments. A further £200 million (S$365 million) of UK funding is expected to go towards developing a full-scale demonstrator power system.

London and Tokyo both have sixth-generation combat jet programs underway with similar time frames for delivery of aircraft. Japan's envisioned fighter, 'The F-X', will replace the Mitsubishi F-2s currently in service with the Japan Air Self-Defense Force from 2035. Meanwhile, BAE Systems, alongside MBDA UK, Leonardo UK, and Rolls-Royce, are leading the nation's Future Combat Air System industrial programme – also known as the Tempest – designed to enter service from the mid-2030s.

UK Director Future Combat Air, Richard Berthon, said, "This initiative with Japan is a win-win opportunity to develop world-beating power technologies together. Investing and working together with Japan to demonstrate highly advanced engine systems will boost our national industries and design a cutting-edge military capability. We're looking forward to getting started on this work and continuing our discussions on further collaboration."

The UK's Future Combat Air System is expected to combine a core aircraft, referred to as 'Tempest', at the heart of a network of wider capabilities such as uncrewed aircraft, sensors, weapons and advanced data systems. Image: BAE Systems

The UK and Japan have also agreed a 'Memorandum of Cooperation' which enables both nations to pursue joint technologies. Together, the UK and Japanese Defence Ministries will explore the feasibility of further sub-systems collaboration throughout 2022. The UK MOD is also supporting Japan in the delivery of their Joint New Air-to-Air Missile (JNAAM) programme.

AIRBUS LAUNCHES NEW AIR CARGO SERVICE UTILISING ICONIC BELUGAS

Airbus has launched a new air-cargo service using its unique Beluga super transporters to offer freight companies and other potential customers a solution to their outsized freight transportation needs. The new service - Airbus Beluga Transport - was announced on 25 January 2022. It aims to serve a variety of sectors, including space, energy, military, aeronautic, maritime and humanitarian sectors.

Phillippe Sabo, Head of ATI and Air Oversize Transport at Airbus, said: "The Beluga's wider cross-section will open up new markets... In the case of loading helicopters - not having to dismantle them first - really is a plus. Similarly, the largest commercial aircraft engines can be accommodated in a fully-dressed configuration."

Airbus' five-strong BelugaST fleet, which has until now been the backbone of Airbus' inter-site transportation of large aircraft sections, are being replaced by six new-generation BelugaXLs.

Once Airbus has commissioned all six new BelugaXLs, the fully-released BelugaST fleet will be handed over to a newly-created, subsidiary airline with its own Air Operator Certificate (AOC) and staff. To maximise the BelugaST's turnaround capability for its targeted international customer base, new loading techniques and equipment are being developed for the operation. These solutions include an automated On-Board Cargo Loader (OBCL) for missions where a loading/unloading platform is not available at the origin or destination airport.

IATA: AIR TRAVEL RECOVERY CONTINUES IN 2021 BUT IMPACTED BY OMICRON

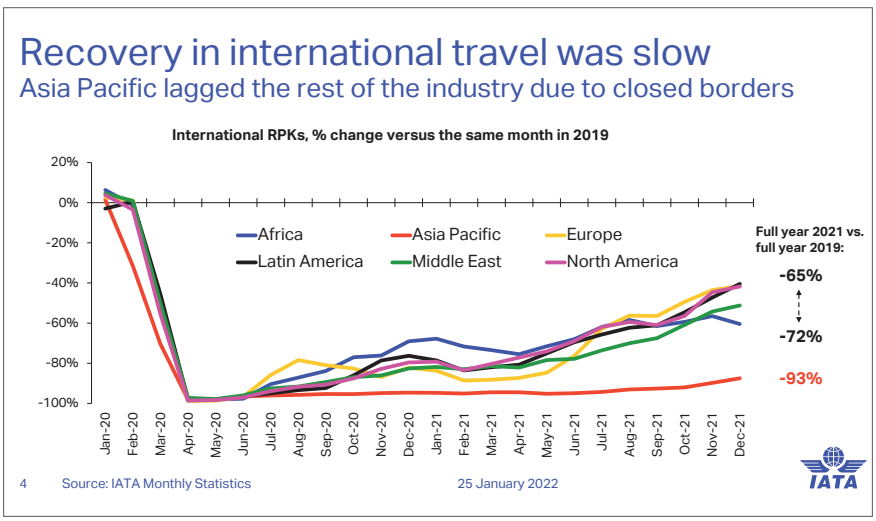
IATA calls for governments to pivot their responses away from travel restrictions as COVID-19 continues to evolve from the pandemic to endemic stage

The International Air Transport Association (IATA) has announced the full-year global passenger traffic results for 2021. IATA's data showed that demand for air travel – measured by revenue passenger kilometres or RPKs – had fallen by 58.4% in 2021 compared to the full year of 2019. This represented an improvement compared to 2020, when full year RPKs were down 65.8% versus 2019.

IATA's analysis revealed that the trajectory of air-travel recovery had continued into the tail-end of 2021 despite Omicron disruptions. "Overall travel demand strengthened in 2021. That trend continued into December despite travel restrictions in the face of Omicron. That says a lot about the strength of passenger confidence and the desire to travel," said IATA Director General Willie Walsh.

Due to the extraordinary impact of COVID-19, IATA's data comparisons for 2021 and 2020 were made to the respective 2019 period, which followed a normal demand pattern.

- International passenger demand in 2021 was 75.5% below 2019 levels. Capacity, (measured in available seat kilometers or ASKs) declined 65.3% and load factor fell by 24% to 58.0%.
- Domestic markets recovered at a faster pace than international routes in 2021 thanks to generally more relaxed travel rules. Domestic demand in 2021 was down 28.2% compared to 2019.
- Total traffic for the month of December 2021 was 45.1% below the same month in 2019, and an improvement from the 47.0% contraction in November, despite concerns over Omicron.



Source: International Air Transport Association

IATA also revealed that Asia-Pacific airlines' full-year international traffic had plunged 93.2% in 2021 compared to 2019, which was the deepest decline for any region. While international RPKs for other regions started to recover mid-2021, Asia Pacific airlines were the only significant outliers, showing little improvement from the peak of the crisis in April 2020. This was attributed to risk averse behaviour of regional governments towards border openings. The full year capacity for Asia-Pacific airlines was down 84.9% compared to 2019 and load factor had fallen by fell 44.3% to just 36.5%.

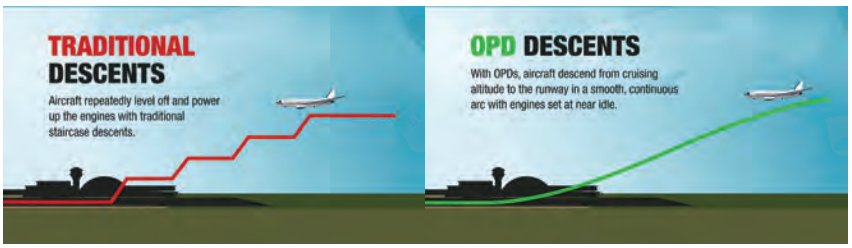
"While international travel remains far from normal in many parts of the world, there is momentum in the right direction," said Walsh. "France and Switzerland (had) announced significant easing of measures ... the UK removed all testing requirements for vaccinated travellers. We hope others will follow their important lead, particularly in Asia where several key markets remain in virtual isolation."

IATA also anticipates that air travel recovery will restart again from March 2022. Its analyses demonstrated that the new Omicron variant had seen less severe symptoms than the previous strains, with a ratio of hospitalizations per cases falling in most countries. This, in turn, raised hopes that the latest outbreak might pass faster than the previous waves and allow air travel to restart in time for the traditionally stronger Q2 and Q3 travel period.

FAA: EFFICIENT DESCENT PROCEDURES DRAMATICALLY REDUCES FUEL BURN AND EMISSIONS

The United States' Federal Aviation Administration (FAA) has estimated that new descent procedures put in place across the country in 2021 will save millions of gallons of fuel and reduce CO_2 and other emissions by hundreds of thousands of tons.

The 42 new Optimized Profile Descents (OPDs) by the FAA allow aircraft to glide down safely from cruising altitudes into airspace for some of the nation's largest airports instead of the fuel-consuming stair-step procedure. Under traditional staircase descent procedures, aircraft repeatedly level off and power up the engines. This burns more fuel and requires air traffic controllers to issue instructions at each step. With optimized descents, aircraft descend from cruising altitude to the runway in a smooth, continuous path with the engines set at near idle.



A simplified illustration of the new Optimized Profile Descents (OPDs) by the FAA. Image: Federal Aviation Administration Youtube

For each group of descents used at an airport, the FAA estimates that an average 2 million gallons of fuel is saved and 40 million pounds (18 million kg) of emissions is reduced annually. "When we multiply the impact by thousands of flights, we gain real fuel savings and real environmental benefits," FAA Administrator Steve Dickson said.

The FAA is implementing a growing number of new flight procedures that use less fuel and reduce noise. Earlier in 2021, it announced more than US$100 million (S$135 million) in matching grants to increase aircraft efficiency, reduce noise and aircraft emissions, and develop and implement new software to reduce taxi delays.

BOEING LAUNCHES NEW 777-8 FREIGHTER, FIRMS UP RECORD ORDER OF 50 AIRCRAFT FROM QATAR AIRWAYS

Boeing has announced the launch of a new 777-8 Freighter on 31 January 2022, with a surprise order of up to 50 aircraft from Qatar Airways.

Qatar Airways Cargo, an international air cargo carrier based in Doha, will be the 777-8 Freighter launch customer with a firm order for 34 jets and options for 16 more. Boeing revealed that the total purchase would be worth more than US$20 billion at current list prices and the largest freighter commitment in its history by value.

The signing of the order took place at the White House, in the presence of senior government and industry representatives, including US Commerce Secretary Gina Raimondo and Qatari Ambassador to the US, HE Sheikh Mishaal bin Hamad Al Thani. The first delivery of the new freighter is anticipated in 2027.

Boeing's 777-8 Freighter is touted as the largest, longest-range and most capable twin-engine freighter in the industry. It features engineering design improvements and innovative technologies, including a new carbon-fibre composite wing and new fuel-efficient engines. The aircraft boasts a range of 4,410 nautical miles (8,167 km), and a maximum structural payload of 118 tonnes.

As part of the agreement, Qatar Airways will convert 20 of its 60 777X family orders to the 777-8 Freighter. Qatar Airways is also ordering two current 777 Freighters to capitalise on the buoyant air cargo market. Boeing and Qatar Airways also signed a Memorandum of Understanding for a firm order of 25 737-10 aircraft and purchase rights for 25 additional aircraft. The total value of this 737-10 commitment is US$7 billion at current list prices.

The-Boeing-777-8-Freighter. Image: Boeing

SIAEC ANNOUNCES NEW SERVICE AGREEMENTS WITH ENGINE MAKERS

The aerospace MRO recently announced two separate 10-year agreements with Safran and Rolls-Royce, to provide engine services in Singapore

SIA Engineering Company Limited (SIAEC) has announced two new and distinct agreements with Rolls-Royce PLC (Rolls-Royce) and Safran Aircraft Engines (SAE), to provide engine MRO services at its recently established Engine Services Division (ESD).

On 4 December 2021, SIAEC announced that it had signed a 10-year agreement with SAE to provide engine test services for the CFM LEAP-1A and -1B engines. SIAEC's engine test facility will be upgraded with the latest data acquisition and control system from Safran Test Cells. The new capabilities will complement SIAEC's existing engine maintenance services agreement with SAE that provides engine On-Site Support, Quick Turn and Boroscope Inspection services for the CFM LEAP-1A and -1B engines.

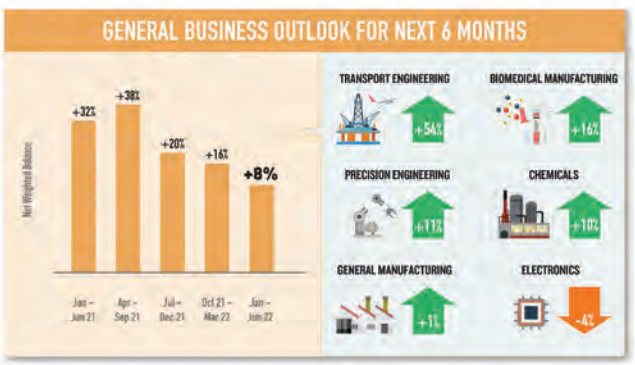
Subsequently on 18 January 2022, SIAEC announced the signing a 10-year agreement with Rolls-Royce to provide line maintenance and in-field services for the engine maker's customers in Singapore. This new agreement is an extension of SIAEC's existing on-wing care services with Rolls-Royce that covers On-Wing Support, Borescope Inspections, Engine Changes and Engine Build-Up services for the Rolls-Royce Trent 1000, 900, 800 and 700 engines, and will be expanded to include new capabilities for the Trent 7000 and Trent XWB engines.

SIAEC had established its Engine Services Division in February 2021 to tap on the projected growth in the aircraft engine services business. The new division aims to provide a comprehensive portfolio of engine-related value-added services, including engine maintenance, parts repair, storage and preservation, material management, on-wing services and engine testing.

SINGAPORE AEROSPACE COMPANIES EXPRESS OPTIMISTIC OUTLOOK FOR 1H2022

Singapore's aerospace segment grew 58.9% in December 2021 compared to the same period in 2020. The data was released in the "Monthly Manufacturing Performance December 2021" report by the Singapore Economic Development Board on 26 January 2022. The growth in output in the aerospace sector was attributed to higher demand for maintenance, repair and overhaul activities, due to the easing of global travel restrictions compared to the previous year. For the whole of 2021, the aerospace industry grew 8.8% compared to 2020, according to preliminary data.

EDB also released a report on "Business Sentiments for January 2022 – June 2022" at the end of January 2022. Overall, business sentiments remain positive despite the uncertainties caused by the COVID-19 variants and pressures on supply chains. The aerospace sector showed optimism, with a net weighted balance of 76% of firms anticipating a favourable business situation in the first half of 2022, compared to the fourth quarter of 2021. A net weighted balance of 61% of aerospace firms also projected a higher level of production in the first quarter of 2022, compared to the previous quarter. The optimism comes as aerospace companies anticipate more aircraft engine repair work from commercial airlines as air travel activities pick up momentum.



Source: Singapore Economic Development Board, January 2022

SINGAPORE AIRLINES AND THE NATIONAL UNIVERSITY OF SINGAPORE LAUNCH NEW DIGITAL AVIATION CORPORATE LABORATORY

New S$45 million research facility to develop cutting-edge solutions in traveller-centric digital services, revenue management, security and safety in air travel, and organisational effectiveness and workplace productivity

Singapore Airlines (SIA) and the National University of Singapore (NUS) launched a new digital aviation corporate laboratory on 10 January 2022 with the aim of co-creating innovative technologies and solutions to accelerate the digital transformation of Singapore's aviation sector.

The SIA-NUS Digital Aviation Corporate Laboratory was officially launched by Mr Heng Swee Keat, Deputy Prime Minister, Coordinating Minister for Economic Policies and Chairman of the National Research Foundation Singapore (NRF). Situated at the Innovation 4.0 Building at NUS Kent Ridge campus, the S$45 million research facility is jointly set up by SIA and NUS and supported by the NRF.

The launch of the Corporate Laboratory comes at an opportune time as the global aviation industry tackles the challenges brought about by the COVID-19 pandemic. The Corporate Laboratory will seek to create and potentially commercialise innovative technologies, support the acceleration of the digital transformation of Singapore's aviation sector, and redefine the air travel experience.

NUS President Professor Tan Eng Chye said, "This significant collaboration will tap into NUS' deep-tech and multi-disciplinary research expertise across artificial intelligence (AI), machine learning, data science, operations research and analytics, optimisation, sleep studies and industrial design, to deliver high value and productivity improvements for SIA, our country's flagship carrier. The innovative technologies developed from the research will redefine the air travel experience for passengers worldwide, while accelerating the digital transformation of Singapore's aviation sector."

The Lab includes a cockpit with Augmented Reality and Virtual Reality (VR) technology to train pilots to respond to a range of simulated scenarios. Photo: National University of Singapore

Featuring state-of-the-art equipment and facilities, such as a cabin simulator and a cockpit simulator with Augmented Reality (AR) and Virtual Reality (VR) technologies, the Corporate Laboratory will leverage NUS' wide and deep research expertise across its faculties and research institutes to embark on research activities in the following areas:

- **Revenue Management and Dynamic Pricing:**
  Developing better techniques by using data-driven methods in demand-modelling, fare pricing and seat allocation to enhance operational efficiencies.

- **Transforming Competency and Skill Development:**
  Developing intelligent and quantified pilot and cabin crew training methods, leveraging eye tracking, AR and VR, as well as post-flight feedback technologies to encourage employees to embrace continuous learning through training.

- **Employee Wellness:**
  Developing intelligent fatigue and alertness models using wearables to improve and enhance safety, performance, and productivity.

- **Passenger Comfort, Sleep and Cabin Service:**
  Developing real environment cabin simulators to enhance customers' comfort, sleep qualities, as well as developing specifications of new product and service protocols for enhanced and unparalleled customer service.

GE AVIATION CELEBRATES 40 YEARS IN SINGAPORE

GE Aviation Engine Services Singapore (GE AESS) celebrated a significant milestone, marking its 40th anniversary on 22 November 2021. To commemorate the milestone, GE AESS also announced a breakthrough as the first Maintenance, Repair and Overhaul (MRO) facility in the world to implement new additive manufacturing technology to the repair of commercial jet engine airfoil components.

Singapore Minister for Trade and Industry, Mr Gan Kim Yong, graced the 40th anniversary celebration at the GE AESS facility in Loyang. Mr Gan noted in his speech, "Singapore is now the largest site for GE's engine component MRO operations, accounting for 60% of its global repair volumes. Over the years it has steadily expanded its operations and anchored more capabilities here. Most recently, in 2019, GE Aviation invested S$42 million to build a new facility in Seletar Aerospace Park to produce high-pressure compressor vanes segments for its GE90 and new GE9X engines that will be used to power next-generation Boeing 777X aircraft."

Beginning in 1981 with only 112 employees, the organisation has grown in tandem with Singapore, beginning from a low-wage assembly to a high-technology, value-adding solutions provider, and regional hub. With 1,700 employees today, GE AESS provides aircraft engine component manufacturing and repair services for over 100 customers, serving as one of GE Aviation's most efficient plants globally.

Lead Scientist, Material Science and Engineering, Lisa Tan (left) with Minister for Trade and Industry Gan Kim Yong (right) explaining the new GE Aviation Service Operations Additive Repair technology. Photo: GE Aviation

The new additive repair technology for component repair at GE AESS was co-developed by local engineers, together with GE Aviation Additive Manufacturing Technology Centers. This new technology is significantly faster than conventional repair techniques with twice as many jet engine parts repaired daily, enabling customers' aircraft to take to the skies again in a shorter period of time.

As part of the celebration, GE AESS honoured seven employees for their long service of 40 years (since the company first began operations). Iain Rodger, Managing Director of GE Aviation Singapore also announced that the company will be looking to drive the creation more than 300 new jobs in Singapore in 2022.

GEO CONNECT ASIA MOVES TO JUNE 2022

The organisers of Geo Connect Asia have announced new dates for the show and conference, which had originally been scheduled for 23rd and 24th March this year. The event will now be taking place from 1st to 2nd June 2022 at the Marina Bay Sands Expo & Convention Centre in Singapore.

Montgomery Asia revealed the change of date on 27 January 2022 to "allow time for local event restrictions and international travel rules to gradually relax".

This will be the second edition of the flagship geospatial and location intelligence industry trade show and conference for Southeast Asia. Following its debut in a hybrid format in 2021, Geo Connect Asia (GCA) 2022 is expected to double in size in terms of participants and floor space. This year's show, which will be a largely in-person format, promises to bring together the latest innovations in surveying and monitoring equipment, sensors, robotics and mapping solutions, among others. GCA 2022 will also be highlighting geospatial applications within the construction and unmanned aircraft systems industry via its Digital Construction Asia (DCA) and Unmanned Aerial Vehicle (UAV) Asia tracks.

BUZZING CITY: DEVELOPING UAS IN URBAN SINGAPORE

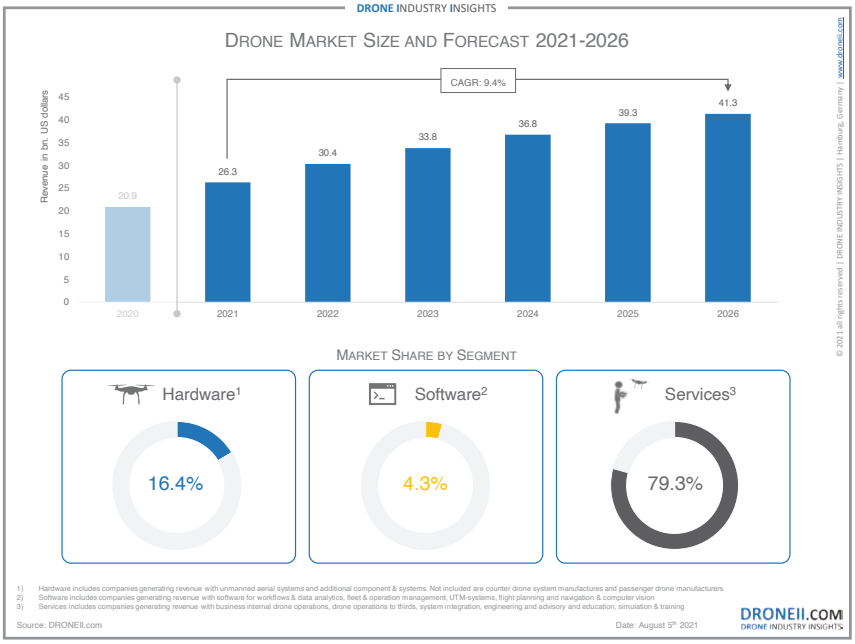
Text by: Simon Whalley and Tay Yun-yuan, Skyports

Singapore's vision to become the world's first Smart Nation has accelerated the development, deployment and commercialisation of UAS operations on a greater scale. The use of drones in such an urban environment holds great potential but needs to be balanced against the need to ensure public safety. In this *Aerospace Singapore* feature, Skyports looks into efforts by the public, private and academic sectors in Singapore to make the vision of integrating UAS into its skies a reality.

Unmanned aircraft systems (UAS) technology has experienced a major global boom in the number and types of commercial applications over recent years. Gone are the days when drones were seen as simply a recreational gadget. Today, UAS is being applied in numerous commercial sectors across the world. From surveillance and inspection, to crop spraying and delivery of cargo, businesses and other organisations are developing and demonstrating new important uses for drones, proving their huge socio-economic potential.

UAS are already solving real-world problems by completing activities quicker, cheaper and safer than traditional alternatives, while boosting local economies. The COVID-19 pandemic has brought the indispensable role of drones to the fore, showcasing its ability to deliver essential healthcare equipment while keeping people in their homes and socially distanced, for example.

Like many countries, Singapore has been seeking to capitalise on the opportunities and advantages presented by UAS. The Asia city state is, in fact, emerging as a regional leader in the development and application of UAS technology in all its forms. The Government of Singapore has demonstrated confidence in the transformative role that this technology could have in economic, social and environment enhancement. So much so that in 2017, it took the important step of including UAS within its Smart Nation strategy. At its core, the strategy has a vision of harnessing and applying UAS technology in ways that could improve the quality of life for everyone in Singapore.



Infographic on the Drone Market in 2021-2026 (Source: Drone Industry Insights)

POTENTIAL AND BARRIERS TO DRONE PROLIFERATION

In August last year, Drone Industry Insights forecasted that the global drone market will grow at a compounded annual growth rate (CAGR) of 9.4% from an estimated value of US$26.3 billion in 2021. This means that by 2026, the UAS industry is set to become a US$41.4 billion industry. The report also highlighted Asia and North America as the strongest UAS markets, with the former expected to experience the fastest growth, above 11% CAGR.

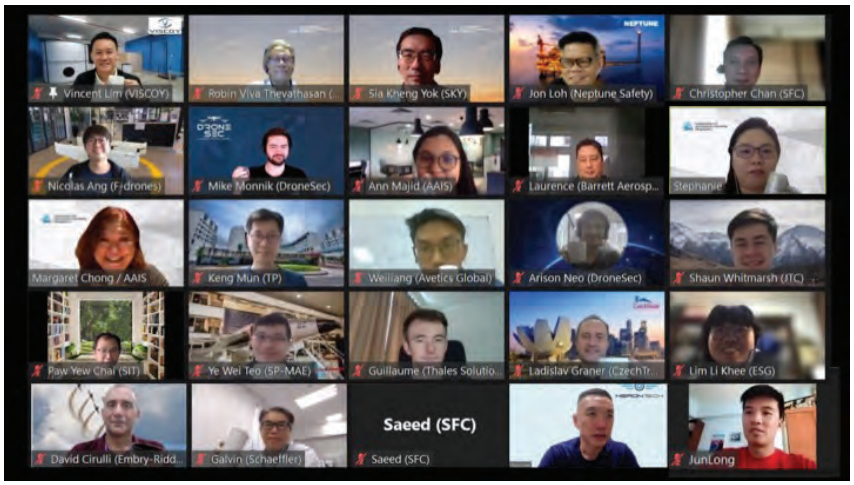
To realise the huge opportunity and harness this substantial economic value, industry and government must work together to identify and resolve the barriers to the proliferation of UAS technology. It is important to remember that the use of UAS around the world is largely regulated, even at the lighter and smaller end of the UAS product market. This is in the context of UAS emerging within the strict confines of an aviation system that is strictly regulated for manned aviation.

To satisfy itself and the people of Singapore that UAS use would be safe, the Singapore Parliament approved the Unmanned Aircraft (Public Safety and Security) Act in 2017. The Act created a clear set of rules for the operations of recreational and commercial UAS "in the interests of public safety and security". Rather than curtail the use of UAS, the introduction of such a regulatory framework, complemented by active support from the Singapore government, has created an environment where the technology can flourish safely and with the confidence of its citizens.

UAS OUTLOOK IN SINGAPORE

Fast forward five years and the Singapore drone industry is growing at a very healthy rate. There are at least 30 drone start-ups[1] in the city state including UAS manufacturers, providers of aerial inspection, delivery drone operators and collectors of data across industries. This growth is reflected in the number of members joining the

[1]Source: https://tracxn.com/explore/Drones-Startups-in-Singapore



A Singapore UAS Community networking session in October 2021

Singapore Unmanned Aircraft System (SG UAS) Community – part of the Association of Aerospace Industries (Singapore) (AAIS) – which represents the interests of the burgeoning drone industry. The Community has experienced an increase in the number of member organisations from 22 in 2019 to 39 today. This number is expected to grow further in the coming years with more activity in the Singapore drone market.

Early growth of the UAS industry and technology in Singapore was substantially boosted by various initiatives and trials supported by its government agencies. Such efforts were useful in demonstrating the capabilities and possibilities of UAS application in a wide range of uses, generating awareness of, and building confidence in the technology.

Singapore also has an advantage in that its population greatly supports the commercial use of drones. A study of public views conducted by a team of academia from the Air Traffic Management Research Institute (ATMRI) and the Nanyang Technological University in 2019 found that 65% of Singaporeans and permanent residents backed the commercial deployment of UAS. The study, which involved 1,050 Singaporeans and permanent residents aged 21 to 80, also found that the Singaporean public had a good perception of the potential benefit of drones. More specifically, they believed that drones can benefits consumers, advance the economy and improve workplace safety.

LEADING THE WAY FOR COMMERCIAL APPLICATIONS

The momentum of UAS development in Singapore has been picking up in the past few years, with increasing interest by the public and private sectors for UAS-based solutions. UAS companies have been responding with the technologies and skills for safe and secure operations. The demand and corresponding efforts to provide tenable solutions will help the sector to scale and become a more permanent fixture in commercial operations.

Maritime test-bed

One industry that has been actively seeking out drones as part of its "creative solutioning" is Singapore's bustling maritime sector.

In 2021, the Maritime and Port Authority of Singapore (MPA) set up a Maritime Drone Estate (MDE) to serve as a test bed for drone operations. The MDE will act as a launchpad from which to test drone technologies, creating opportunities to improve safety

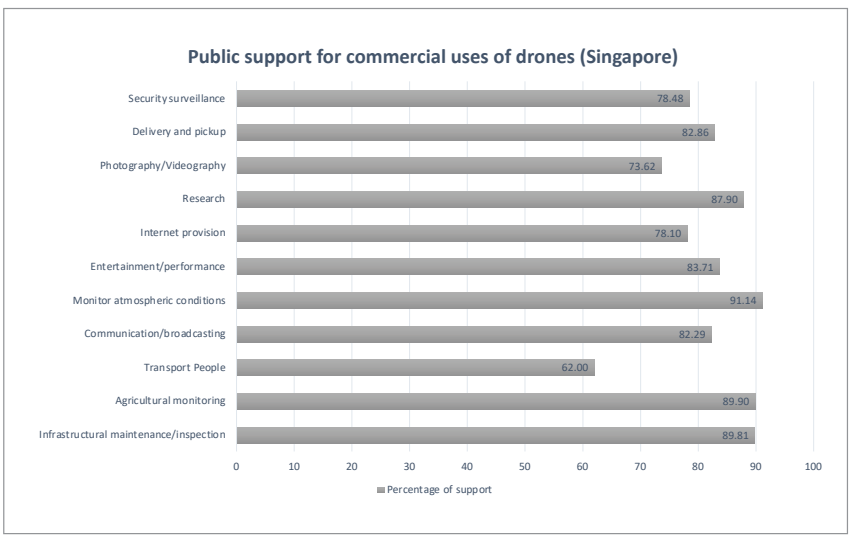


Chart by Aerospace Singapore. Data source: Tan et al, Public acceptance of drone applications in a highly urbanized environment, 2021

[2] Tan, L. K. L., Lim, B. C., Park, G. G., Low, K. H. & Yeo, V. C. S, Public acceptance of drone applications in a highly urbanized environment, 2021

Mr Chee Hong Tat (right), and Ms Quah Ley Hoon, MPA Chief Executive at the launch of the Maritime Drone estate. Photo: Maritime and Port Authority of Singapore

standards, efficiency, sustainability and access.

At the Singapore Maritime Technology Conference in April last year, Mr Chee Hong Tat, Senior Minister of State for Foreign Affairs and Transport said, "(UAS) technologies can help the port of Singapore, and ports around the world, to become more productive and efficient." In the last couple of years, Singapore authorities had been facilitating the testing of drone use cases for maritime industry players in a sandbox environment. The new drone estate location at Marina South is located next to port waters and near active anchorages used by thousands of vessels annually. This would make it ideal grounds to test out UAS services concepts as well as its reliability, safety and accuracy. Mr Chee added, "We hope to grow more maritime start-ups…and will continue to support them at the Maritime Drone Estate at Marina South."

One particular area that is being explored at MDE is the movement of maritime logistics between ship and shore. Traditionally, this is a labour-intensive, time-consuming process, with higher risks and a sizeable carbon footprint. With drones, essential supplies can be transported safely and securely, and in a more cost effective and less carbon-intensive manner. Trials have already been completed from the drone estate, including ship-to-shore use-cases by various shipping and logistics companies. UK-headquartered drones-as-a-service provider, Skyports, had also recently initiated a flight demonstration from the MDE, where its aircraft flew circuit profiles with a total distance of 50km travelled in 30 minutes.

Reservoir inspection

Skyports has also been supporting Singapore aerospace giant, ST Engineering Aerospace, in carrying out automatic inspection of local reservoirs using unmanned aircraft capabilities.

A Skyports drone being piloted at the MDE in Singapore. Photo: Skyports

The project, launched by Singapore's National Water Agency (PUB) at the end of May 2021, saw the deployment of Beyond Visual Line of Sight (BVLOS) drones to conduct monitoring at six reservoirs. The unmanned aircraft is equipped with remote sensing systems and cameras that help monitor water quality, identify overgrown aquatic plants and algae, and potential concerns such illegal water activities in a particular area.

PUB plans to have one drone deployed at each reservoir. At MacRitchie and Marina, the drones are housed in an automated pod, capable of taking off and landing autonomously. It will embark on pre-programmed flight paths within the reservoir compound, monitored remotely by an operator. PUB officers will be able to monitor the statistical data and live-video feed from the drone via an online dashboard and receive near real-time alerts via their mobile phones.

By integrating UAS technologies into its processes, PUB is able to save thousands of 'man-hours' each year and significantly reduce the carbon footprint associated with traditional means of completing these tasks. Mr Yeo Keng Soon, Director of PUB's Catchment and Waterways Department said, "With 17 reservoirs – which are an important water supply source for Singapore – under our care, it can be a challenge manpower-wise to effectively monitor what goes on at each reservoir and ensure the reservoirs are in optimal condition… With the drones, we can channel manpower to more critical works such as the inspection and maintenance of reservoir gates, as well as pump and value operations."

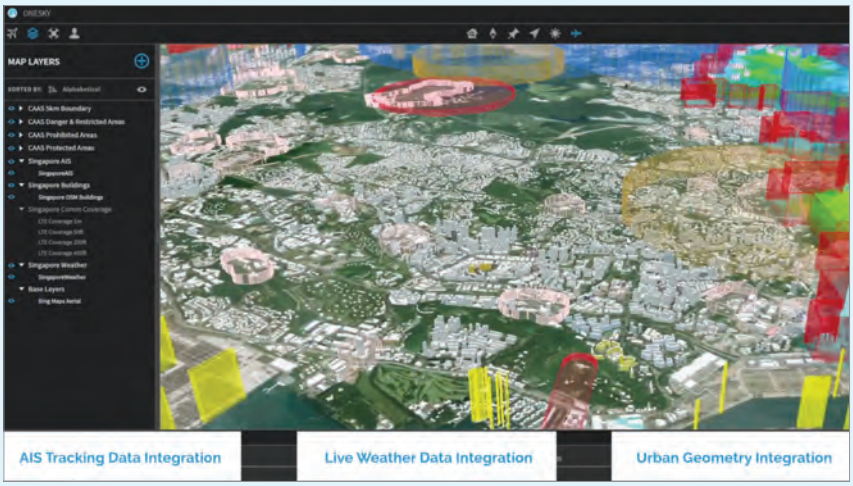
Unmanned traffic management

Complex commercial operations such as the reservoir inspection system and shore-to-ship deliveries that are undertaken in an urban landscape are often dependent on the drones being flown BVLOS. However, many countries still require pilots, visual observers and flight controllers to see a drone throughout its flight. To become a permanent feature on the future landscape, UAS will ultimately need a means to be safely and securely managed with other aircraft users operating within the low-level airspace.

In 2017, the Civil Aviation Authority of Singapore (CAAS) and Singapore's Ministry of Transport (MOT) launched an industry call for proposals to research, develop, test and introduce a functioning Unmanned Traffic Management (UTM) system. Nova Systems led a consortium of partners including OneSky and M1 to research and develop a suite of advanced UTM services over a three-year period. Considerations for the system include flight authorisation, strategic deconfliction and remote identification capabilities. The project came to a conclusion in early 2021, with a demonstration of those capabilities in a working UTM system through live BVLOS flight trials in the skies above Singapore.

Infographic on PUB's drone deployment (Source: PUB, May 2021)

Projects like these aid CAAS in developing operation concepts for unmanned traffic management in preparation for a scale up of commercial operations in Singapore.



Overview of OneSky's UTM Portal, demonstrating airspace constraints such as aerodromes, restricted flight areas, weather and urban geometry (Image: OneSky)

UAS Pilot Training

As unmanned aircraft do not have pilots on board, UAS will need to be remotely piloted or operated from nearby or at a central location, at least in the near future. As the number of use cases and commercial operations increases, the supply of qualified and skilled UAS pilot personnel must keep pace to avoid the emergence of a skills gap. Singapore is blessed with a number of drone pilot training schools and academies that are approved by the CAAS.

Autonomous drone systems designer and manufacturer Garuda Robotics, was the first organisation in Singapore to receive CAAS approval as an Unmanned Aircraft Training and Assessment Organisation (UATO), setting the standard for professional drone training in the region. Meanwhile, in 2017, tertiary education institution Republic Polytechnic (RP) established the first dedicated drone training facility among Singapore's institutes of higher learning. RP has been offering industry-focused

courses involving subjects like thermal imaging, search and rescue, and photogrammetry. As of January 2022, there are 13 CAAS-approved UATO in Singapore.

UAS IN URBAN SETTINGS: ADDRESSING CHALLENGES

Despite such a bright outlook for the future of UAS solution, there are parts of the drone ecosystem that need to be further developed for the full potential of the technology to be realised. These include the technological performance of the unmanned aircraft and the regulation of more complex operations.

Drone technology is still in relative infancy despite the large number of platforms available and use cases being operated. It is much easier to make a safety case for operations over sparsely populated areas - where the risk to those on the ground is less - than in urban centres like Singapore. In order to operate in more densely populated settings, UAS operators will have to achieve a higher level of safety standards that can satisfy regulators. In reality, the unmanned aircraft being used is going to have to achieve the same level of airworthiness as manned aviation to operate in the likes of cities. This will not be an easy or cheap process but UAS technology must continue to evolve at pace so that it stands up to the rigours of certification processes.

Similarly, operation of UAS in locations where the airspace is lightly used by manned aviation can achieve approval more easily. However, the holy grail is the integration of manned and unmanned in the same airspace and in areas of greater air traffic density. A regulator is unlikely to approve these operations without the drone flown beyond the remote pilot being able to automatically and, most importantly reliably and safely, avoid manned traffic. Systems that enable UAS to autonomously 'detect and avoid' other aircraft are achieving a good level of maturity and, with regulator approval in time, will be a gamechanger for the UAS industry and its commercial operators.

ONWARDS AND UPWARDS

Drone technology, especially for commercial operations, is proving day-by-day that it is a reliable solution to real-world problems. In many instances, UAS have proven that it can support businesses and public sector organisations to execute essential activities more quickly, cost-effectively and safely. The economic value of the UAS market is set to be huge and will translate into revenue generation, the creation of new jobs and export opportunities.

Singapore has emerged as a regional leader in UAS solutions. Through close coordination between a proactive and forward-leaning government and an innovative and ambitious industry, the city state is fast developing a drone ecosystem that will support permanent commercial UAS operations. Further technological development and regulatory advancement, especially public acceptance, will be key to the industry having a rosy future. Government and the industry will need to take the public with them on this exciting journey.

All in all, UAS is set to be an exciting and enduring feature in the landscape of tomorrow, with a bright future ahead where the sky will not be the limit.

A dazzling display of a Singapore icon, the Merlion, made up of 500 drones hovering above The Float @ Marina Bay during the Star Island Singapore Countdown Edition on 31 December 2019. (Image: Star Island Youtube channel)

Singapore Unmanned Aircraft Training and Assessment Organisations

AETOS Security Management Pte Ltd	https://www.aetos.com.sg/Training/WSQ-Courses
Air Beacon Pte Ltd	https://www.airbeacon.com.sg
Apollo Global Academy Pte Ltd	http://apollodronesacademy.com/
Avetics Global Pte Ltd	https://www.avetics.com/academy
CWT Aerospace Services Pte Ltd	https://www.cwtaerospace.com
Drone Element Pte Ltd	https://www.dronelement.com/
Garuda Robotics Pte Ltd	https://uato.sg
Institute of Technical Education	https://www.ite.edu.sg/courses/part-time-courses/skillsfuture-series-certificate-of-competency
MF Media Academy Pte Ltd	https://www.mfmedia.sg/drone/
MIRS Innovate Pte Ltd	http://www.mirs-innov.com/uato
Republic Polytechnic	https://www.rp.edu.sg/ace
Singapore Polytechnic	https://www.sp.edu.sg
Singapore Flying College	https://www.sfcpl.com/

Source: Civil Aviation Authority of Singapore

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SUPPLEMENT

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Co-ordinated by:

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SINGAPORE PAVILION | CONTENTS

The aerospace industry is starting to emerge from a historic crisis brought about by the COVID-19 pandemic. It will still be another tough year for most businesses. But air cargo has recovered and to a large extent, so as domestic air travel. Having spent much of the last two years restructuring and preparing for the future, businesses are eager to emerge from the pandemic and showcase their new products and services.

At Singapore Airshow 2022, the Singapore aerospace industry is keen to welcome old friends, new business contacts and fresh opportunities. We have navigated many uncertainties to get here and are looking forward to the show.

We welcome you to explore possibilities with us at the Singapore Pavilion!

Sia Kheng Yok
Chief Executive
Association of Aerospace
Industries (Singapore)

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ENTERPRISE SINGAPORE

Enterprise Singapore is the Singapore government agency championing enterprise development. It also supports the growth of Singapore as a hub for global trading and startups.

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JTC is the government agency championing sustainable industrial development. Together with our partners, we masterplan clean, green and smart estates as attractive destinations for talent and the community. We also drive innovation in the Building and Infrastructure sector.

For more information on JTC, visit **www.jtc.gov.sg**

BOOTH
A-C11

ACP METAL FINISHING PTE LTD

ACP Metal Finishing Pte Ltd is an established surface finishing company serving the industries for 40 years. ACP is a major player for surface finishing supporting both the aerospace OEM and MRO companies. ACP is an approved supplier to esteemed companies such as Boeing, Collins Aerospace, Eaton, GE, Honeywell, Meggitt, Moog, Parker, Pratt and Whitney and Thales. ACP is also a certified repair station by the Civil Aviation Authority of Singapore (CAAS), the US Federal Aviation Administration (FAA) and the European Union Aviation Safety Agency (EASA).

Areas of Expertise:

- Various types of anodizing
- Plating of electroless nickel, chrome, cadmium, electrolytic nickel, silver and tin
- Painting of primer, top coat and dry film lubricant
- Non-destructive testing of MPI, FPI, ET and UT.

Certifications:

- ISO 9001:2015 QMS
- AS 9100D QMS
- SAR 145 by CAAS (AWI/204)
- FAR 145 by FAA (OXQY401Y)
- EASA 145D1 Certification by EASA (EASA.145.0906)
- Nadcap - Chemical processing
- Nadcap - NDT

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BOOTH
A-C14

AIRTEC CORPORATION (ASIA) PTE LTD

Airtec Corporation designs, manufactures and distributes digital tyre inflation systems to over 120 countries in the world. As a global leader, we focus on innovation to ensure we continuously deliver new and innovative products. Our inflators are known for its accuracy, durability and ease of use.

Airtec products are manufactured in Singapore, to ISO 9001:2015 quality standards and is accredited by SGS International Certification Services Singapore Pte Ltd. Our digital tyre inflation systems are used in aviation, automotive, military, transport, retail petroleum and motorsports industries.

Areas of Expertise:

- Over 25 years of experience in the design, development and manufacturing of Digital Tyre Inflation Systems.
- Airtec Digital Tyre Inflators are manufactured in Singapore

Certifications:

- ISO 9001:2015

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BOOTH
A-C17

ALPHA@TANGO PTE LTD

Apha@Tango (A@T) was founded in May 2011. Its core business is to provide consultancy services and market development expertise to defence industries. A@T comprises defence subject matter experts with decades of military experience, who are up to date on warfighting capability development and defence products development, especially in the domain of land platform fighting systems. A@T has an extensive network to the land platform defence industry and its clients include several major defence multi-national companies.

Areas of Expertise:

- Defence market development in ASEAN focusing on Singapore, Indonesia, Thailand and ASEAN.
- Business strategy, networking, marketing and engagement plans.
- Product marketing and partnership.
- Research and studies on:
  (1) Current and future land warfare technology requirements of military forces;
  (2) Product and capability focus;
  (3) R&D; and
  (4) Innovative solutioning.

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BOOTH
A-D12

ALPSUN PTE LTD

Alpsun Pte Ltd was established to meet the accelerated demand in the Military, Homeland Security and Aviation markets in the Asia Pacific region. We constantly build up our network, offering our consultancy, engineering services and establish relationships with renowned OEMs e.g. Leonardo, L3 Harris- WESCAM, Honeywell, E.R.A, SiATM. In January 2022, we set up APOGEE APAC Pte Ltd to launch a series of products, focusing on Lithium-ion Phosphate Battery solutions to address the fast growing green energy space i.e. Battery packs, Uninterrupted Power Supply and customised solutions in the Military, Security, Telecommunication, Commercial and sustainable energy storage segments.

Areas of Expertise:

- Consultancy
- Engineering & Maintenance Support
- Aftersales market sales for aviation spares and components
- Customised Lithium-ion Phosphate battery solutions

Certifications:

- ISO 2015:9001
- BizSafe 3 certified
- TRACE certified

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BOOTH
A-C15

APPS-CONNECT PTE LTD

Apps-Connect, as the name suggests, aims to connect companies with applications that are niche to various industries, putting these companies at the forefront with an edge over their competitors. Apps-Connect offers solutions to the consumer, industrial, medical, military and security markets around the world so their customers can stay engaged within the IoT arena and keep up with the emergence of disruptive technologies.

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BOOTH
A-C13

CBMM SUPPLY SERVICES AND SOLUTIONS PTE LTD

KeepFlying® is a data science as a service Financial Twin platform that uses explainable AI and advanced ML techniques against your Assets and MROs historic & dynamic airworthiness, maintenance and operational data to accurately forecast cashflows, revenue potential.

Areas of Expertise:

- Data Wrangling – Historic & Dynamic Airworthiness & Operational data
- Hangar / Shop Visit Profitability Data Models (Aircraft / Engine specific)
- Remaining Useful Life & Residual Value Simulator
- Aircraft / Engine Redelivery Models
- Portfolio Cashflow Models

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BOOTH
A-D16

DIAMOND AVIATION PTE LTD

Established since 2011, Diamond Aviation has witnessed rapid growth in the sales and leasing of multiple large assets and component packages. Major assets available for lease include Aircraft, Engines and Landing Gear Sets for B737s, A320s, A330s & A340s. We also continually look for profitable teardown candidates; aircraft, engines and landing gears.

As a Part 21 approved Design Organisation Approval (DOA) company, we have capabilities for design engineering of aircraft parts.

Areas of Expertise:

- Lease/Teardown Aircraft, Engines and Landing Gears
- Design engineering of aircraft parts

Certifications:

- Civil Aviation Authority of Singapore (CAAS) Part 21 DOA (Design Organization Approval)
- ISO9001:2015
- ISO14001:2015
- FAA AC-56 organization

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BOOTH
A-C23

HOPE TECHNIK PTE LTD

HOPE Technik, a Singapore-proud engineering company, has been evolving the industry landscape with its technological innovations since 2006.

Together with a team of dedicated engineers and technical personnel, HOPE Technik is committed to deliver innovative products and solutions, translating concepts into reality.

Areas of Expertise:

- Defence Equipment
- Rapid Prototyping
- Conceptual Design
- Emergency Fighting Vehicles

Certifications:

- ISO 13485 : 2016
- ISO 9001 : 2018
- HCP (Human Capital Partnership) under TAFEP (MOM)
- BizSafe 3 (Next audit to be completed by Jan 2022)

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BOOTH
A-D24

HYPERCOAT ENTERPRISES PTE LTD

Hypercoat Enterprises Pte Ltd was incorporated in April 1985. Amidst many challenges and driven by optimism and the ambition to be a significant player in the field of aviation supply, the company has grown from strength to strength, representing more than 50 vendors from USA and Europe and serving their interests worldwide through our sales offices in Singapore, Malaysia, China, India, United Arab Emirates, America, Europe, Chile & South Africa.

Areas of Expertise:

- Aircraft systems and spares for airframe and engine
- Aircraft coatings and chemicals
- Interior furnishing and refurbishing
- Aerospace composites
- In-flight services – entertainment and consumables.
- Cargo, ground and workshop equipment

Certifications:

- AS9120 Rev. B
- ISO 9001:2015
- ASA100
- bizSAFE 3
- Civil Aviation Authority Singapore (CAAS)

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BOOTH
A-D08

IHAWK GLOBAL PTE LTD

IHAWK Global is a team of experienced and talented individuals in the field of design and manufacturing of Unmanned Aerial Vehicle for the domains of Maritime Logistics, Maritime container inspection and Fire-fighting etc.

Our goal is to accelerate the adoption of sustainable energy in the industries we serve. Our core strengths are combining attractive looking design, to industrially functioning products that our clients will be able to utilise in meeting their needs. We believe industrial products can look attractive at the same time to meet all requirements set out in the design stages.

Areas of Expertise:

- Maritime Logistic drone
- Maritime Container Inspection drone
- Firefighting drone
- Urban Mobility

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BOOTH
A-D06

TRANSFINGO AVIATION SOLUTIONS PTE LTD

TransFingo Aviation Solutions (TAS) helps airlines and MRO companies to optimize aircraft inventory holding cost while reducing aircraft/component down time and without compromising airworthiness quality by supplying used serviceable materials. TAS is also a manpower supplier and in the businesses of consulting & business process outsourcing, with more services constantly being added into our portfolio. Our team consists of industry veterans who have served major airline/MRO/OEM companies for more than 30 years.

Areas of Expertise:

- Supply of used serviceable materials
- Supply of aircraft expendables
- Executive placement search and skilled manpower outsourcing
- Consultancy and Advisory Services
- Business Process Outsourcing

Certifications:

- AS9120:B
- ISO 9001:2015

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BOOTH
A-D18

TRD CONSULTANCY PTE LIMITED

TRD Consultancy Pte Ltd is a Singapore based private limited company specializing in C4I and advanced security systems. We produce the Anti-Drone system known as ORION Anti-Drone system that has been fielded in many countries. The company's other business activity includes turnkey, system integration, trading, consultancy and market development services to security and defence industries. TRD began operations in Singapore in 2011 and today represents several international defence suppliers in the ASEAN market. The company's main business portfolio includes application in ASEAN, Middle East and parts of Europe.

Areas of Expertise:

- Producer of Anti-Drone System
- Turn-Key, System Integration, Supply, Consultancy
- Technology Focus - C4I & Security
- Market Focus - ASEAN, Reaching out to Middle East & Europe

Certifications:

- ISO 9001:2015

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Additive Manufacturing
HOPE Technik Pte Ltd

Aircraft Ground Support Equipment
Airtec Corporation (Asia) Pte Ltd
Hypercoat Enterprises Pte Ltd

Aircraft Interiors
Hypercoat Enterprises Pte Ltd

Anti-Drone Systems
TRD Consultancy Pte Limited

Avionics
Hypercoat Enterprises Pte Ltd

Certification & Consultancy
Alpha @Tango Pte Ltd
Diamond Aviation Pte Ltd
TransFingo Aviation Solutions Pte Ltd

Components
Alpsun Pte Ltd
Hypercoat Enterprises Pte Ltd

Composites
HOPE Technik Pte Ltd
Hypercoat Enterprises Pte Ltd

Defence & Military Products & Services
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Alpsun Pte Ltd
TRD Consultancy Pte Limited

Distributor of Aircraft Parts & Equipment
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TransFingo Aviation Solutions Pte Ltd

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Airtec Corporation (Asia) Pte Ltd

Digitalisation
Apps-Connect Pte Ltd

General Stockist
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Industry Association
Association of Aerospace Industries (Singapore)

Inspection and Testing
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Diamond Aviation Pte Ltd

Leasing/Teardown Large Assets
Diamond Aviation Pte Ltd

Lithium-ion Phosphate Battery
Alpsun Pte Ltd

Logistics/ Cargo
iHawk Global Pte Ltd
Hypercoat Enterprises Pte Ltd

Maintenance, Repair & Overhaul services
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Diamond Aviation Pte Ltd
Hypercoat Enterprises Pte Ltd

Manpower Suppliers
TransFingo Aviation Solutions Pte Ltd

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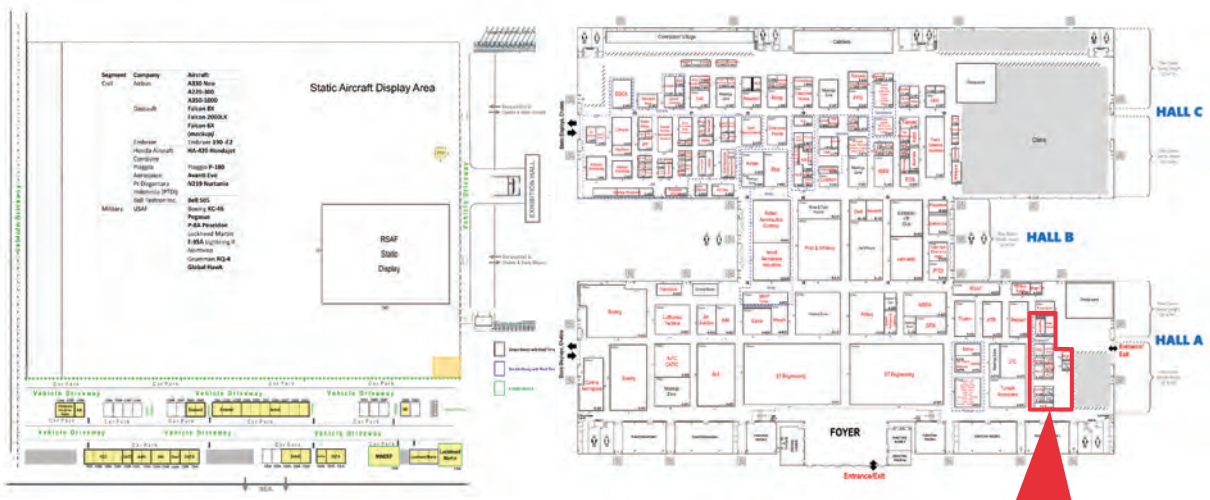
Robotics & Automation
HOPE Technik Pte Ltd
iHawk Global Pte Ltd

Software Systems and Applications
Apps-Connect Pte Ltd

Surface Treatment
ACP Metal Finishing Pte Ltd

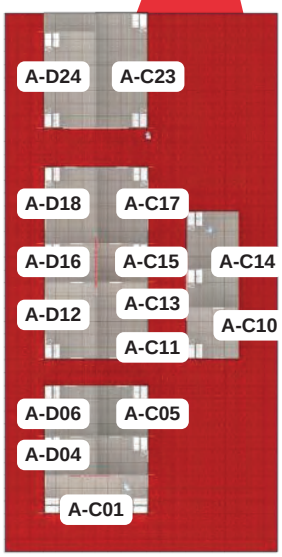
Unmanned Aircraft Systems
Association of Aerospace Industries (Singapore)
iHawk Global Pte Ltd

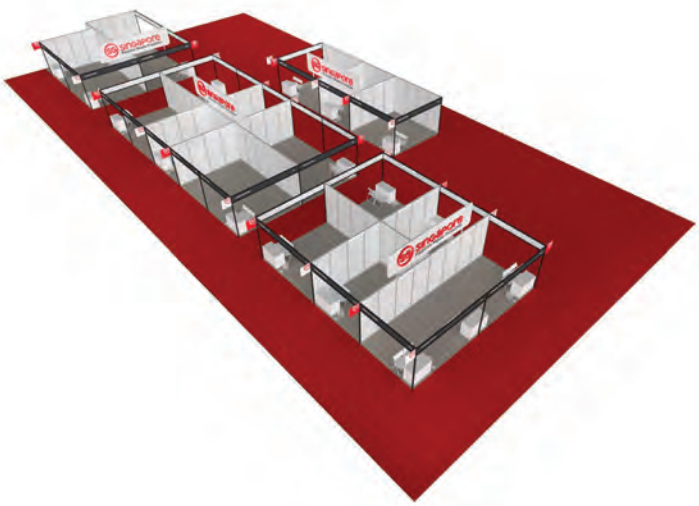


EXHIBITORS

A-C11	ACP Metal Finishing Pte Ltd
A-C14	Airtec Corporation (Asia) Pte Ltd
A-C17	Alpha@Tango Pte Ltd
A-D12	Alpsun Pte Ltd
A-C15	Apps-Connect Pte Ltd
A-C01	Association of Aerospace Industries (Singapore)
A-C13	CBMM Supply Services and Solutions Pte Ltd
A-D16	Diamond Aviation Pte Ltd
A-C23	Hope Technik Pte Ltd
A-D24	Hypercoat Enterprises Pte Ltd
A-D04	iHawk Global Pte Ltd
A-D06	TransFingo Aviation Solutions Pte Ltd
A-D18	TRD Consultancy Pte Limited

PLAN VIEW





Meeting Pods
A-C05 & A-C10

BOOTH
A-C01

Association of Aerospace Industries (Singapore)

The Association of Aerospace Industries (Singapore) or AAIS, is a not-for-profit organisation established in 2003 to promote the development of Singapore as a leading aerospace hub. Its vision is "An Innovative Aerospace Community for a Sustainable Future."

AAIS represents companies involved in aviation, aerospace and unmanned aircraft systems, including maintenance, repair and overhaul (MRO), manufacturing, parts distribution, research & development, training and education, and aftermarket services. It serves as the voice of industry to influence future directions and policies, facilitates business and engenders the development of the industry community.

For more information, visit **www.aais.org.sg**.

SINGAPORE PAVILION
SINGAPORE AIRSHOW

2022

SUPERWOMAN FLYING HIGH

An interview with the youngest woman to fly solo around the world

It was a very special Christmas eve in Singapore as aviation enthusiasts received a visit, not from old Saint Nicholas, but from intrepid 19-year-old aviator Zara Rutherford. With her arrival at Singapore's Seletar Airport on 24 December 2021 onboard her Czech-Slovak Shark aircraft, the Belgian-British pilot was well on course to breaking the world record as the youngest woman ever to circumnavigate the globe, and the youngest person ever to fly around the world in an ultralight.

Aerospace Singapore caught up with Zara during her short stayover in the city state.

Hi Zara, welcome! How was your flight into Singapore?

Thank you! There were a few issues today because I was flying quite low to the ground due to the thunderstorms around me. Typically, to fly into Seletar you need to be about 1,500 feet above the ground to make sure you clear all the buildings, but I could not do that because of the clouds. So, I had to wait about half an hour outside of Singapore and discuss with air traffic control. Ultimately, I was able to go in because I had visual and could ensure there was enough distance between me and any buildings. Once I got near the airport, it was a good and easy landing.

Can you share with us some of the more unique or scary moments of your trip thus far?

Flying around the equator at this time is a little tough because it is the monsoon season and there are many thunderstorms. All in all, it is not too bad though because it is quite populated around here. In northern Russia, it was completely different because nobody lived in places like Siberia. It was quite scary because if the weather turned bad, I would not have much of a choice. I could do an emergency landing but I would be hours away from the nearest help and I am not sure how long I would be able to survive in -30C temperatures without proper equipment!

I also had to change plans sometimes, like avoiding a landing in China due to changes in Covid-related regulations. I had to then fly a long way over the sea from Russia to South Korea, while avoiding North Korean airspace. When I was flying from Kota Kinabalu to Jakarta, I faced a sudden turn of weather. In the end, I decided to land at a small airport in Ketapang. They were not

Zara arriving in her bespoke Shark ultralight aircraft at Seletar Airport. Photo: Aerophotoworks for SHARK.AERO

expecting me, and I could not explain the situation because it was not an international airport. I was not allowed to leave airport property and had to stay in the terminal. It was not the most comfortable but I was so thankful that the people were extremely helpful and kind, and I had some good Indonesian food! Everywhere I went, I met extremely friendly people eager to help and encourage me to continue my mission.

What made you decide to start this amazing journey?

At first, I was planning to fly around the world as an adventure during my gap year, not realising I would become the youngest woman to do so if I achieved it. It was only when I started researching more that I found out that the youngest man who has flown solo around the world was 18 years old while the youngest woman was 30 at the time of her flight. With my flight I wanted to reduce this gap from 12 to only 1 year. At the same time, breaking the world records is not the most important thing. I will consider my mission a success if I manage to inspire young women. I want to show them that they can be bold, and they can have ambitious dreams.

Tell us more about your mission to inspire girls and young women

Globally only 5% of commercial pilots and 15% of computer scientists are women. In both areas – aviation and STEM – the gender gap is huge. During my journey I met many incredible, talented women – pilots, engineers, car racers. I believe together we can make a real change. We can encourage other women to be bold, ambitious and pursue their dreams.

How about your parents? How did they feel about your grand mission?

I was born in a family of aviators and was lucky to have great role models in my parents and grandparents. Both my parents are pilots, so they strongly support me. My father was very enthusiastic and helps me with the logistics of it all. My mother was also very excited but more cautious, but I was able to convince her.

Zara's aircraft approaching Seletar Airport after gaining clearance from the control tower. Image: FlightAware

Can you tell us about the aircraft that you flying in?

I am flying a Shark ultralight, the world's fastest microlight aircraft. It is extremely fast (300km/h), has a very long range, is very safe and extremely capable. Mine has been modified with extended range to 1800nm (3500km), with satellite communications. I am very grateful to Shark for their loan of such a beautiful machine.

Photo: FlyZolo

You are well on your way of completing your mission. What's going to be next?

On the days that I don't fly or when I have my rest days, I am putting in my applications to universities. I am planning on studying Computer Science or Electric Engineering as I dream of one day going into space.

Zara Rutherford completed her mission on 20 January 2022 when she landed back in Kortrijk-Wevelgem, in Belgium. At 19 years of age, she became the youngest woman in history to fly solo around the world in a small aircraft. Her journey lasted 155 days or 5 months and 3 days – twice as long as expected due to delays caused by bad weather. Having completed her circumnavigation, Zara is now the holder of two Guinness World Records (GWR). Our heartiest congratulations!

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BRINGING SINGAPORE'S AEROSPACE TOWARDS CLEARER SKIES

Aerospace Singapore speaks to Ms Lim Ai Ting, JTC's Aerospace and Marine Cluster Director, on how JTC continues to position Singapore as Asia's leading aerospace hub amid strong headwinds.

The COVID-19 pandemic has had an unprecedented impact on the aerospace industry. How has JTC shifted its strategy to face the current challenges and maintain Singapore's status as a leading aerospace hub?

JTC recognises that the industry continues to have bright spots and opportunities for long-term growth, and we're committed to helping our companies recover and tap new growth opportunities.

To help companies transform and prepare for the aerospace recovery, we have worked closely with the Singapore Business Federation and McKinsey to offer the Industry 4.0 Human Capital Initiative (IHCI). The IHCI immerses companies in an intensive consultancy programme, advising companies on how to implement greater automation and more efficient processes that increase output and reduce costs. One aerospace company that has benefited is AVIMAC, where the solutions provided through the IHCI programme were able to increase their machine productivity by 10%.

Looking ahead, JTC continues to develop the infrastructure at Seletar Aerospace Park (SAP). Our latest development, JTC aeroSpace Three ('AS3'), provides companies with "plug and play" solutions for new aerospace manufacturing & MRO activities. We also continue to prepare capacity through our latest phase of infrastructure works to support future aerospace activities.

JTC aeroSpace Three at Seletar Aerospace Park. Photo: JTC

Besides being an infrastructure developer, how else does JTC engage with the aerospace industry?

JTC's role extends beyond just being an infrastructure provider. We invest heavily in a community-based strategy where we tap on our network of stakeholders to curate industry leading events that advance the interests of the aerospace industry.

Take for example, Aerospace Day, one of JTC's signature talent outreach events, organised in collaboration with the Association of Aerospace Industries (Singapore) (AAIS), all 5 polytechnics, the Institute of Technical Education, and NTUC's Employment and Employability Institute. Aerospace Day offers students a closer look at the exciting opportunities in the aerospace industry and is part of JTC's Industry Connect initiative to help businesses in our estates attract talent, adopt technology, and embark on sustainability initiatives. As the sector continues to recover, initiatives such as Aerospace Day will help companies to bridge the talent gap.

Seletar has grown into a thriving lifestyle destination, what has been JTC's approach to curating the estate?

We place great importance in making SAP a great place to work and play. Nestled in the heart of the estate is The Oval. This rustic lifestyle hub features restaurants and amenities housed within refurbished black-and-white colonial

bungalows and has grown over the past 2 years to include new tenants like 5 by Sans Façon, F45, SID Events, and Chow Cute Café. We have also continued with our efforts to make The Oval a lively destination with seasonal events and installations such as Candylicious Wonderland during the holiday periods.

How has JTC's efforts in promoting sustainability been progressing?

Sustainability is key to JTC's vision for our estates. In August 2021, we launched the inaugural Singapore Aerospace Industry Solar Adoption Report (SAISAR) together with AAIS. We are thrilled to see that on average, the aerospace industry's solar capacity grew 83% per year from 2013 to 2020. This reflects the strong commitment from Singapore's aerospace industry to reduce their carbon footprint through renewable energy.

To help companies on their solar journey, JTC launched our SolarRoof initiative which allows our lessees to tap on JTC's master contract and install solar panels at their facilities with zero upfront capital outlay.

Can you share what you think the future holds for the aerospace industry?

One area on the rise is digital services, with more data being collected from aircraft, MRO hangars and at OEM plants. We will see greater utilisation of AI to perform predictive maintenance and optimise manufacturing processes.

Advancements in autonomous technologies have fueled research into urban air mobility that will increase regional connectivity. These developments will lay the foundations for larger scale autonomous flights, reducing airline operating costs and increasing safety.

Wheelers Estate at The Oval. Photo: JTC

Lastly, aerospace companies have renewed their commitment towards sustainable air travel. An increasing appetite for sustainable aviation fuels and new developments in electric-powered and hydrogen-powered flight will usher in an exciting new era of sustainable aviation.

THE DEVELOPMENT OF SELETAR: 1971 AND BEYOND

Singapore's Seletar Airport and its surrounding real estate is known for its serene and tranquil atmosphere. Behind this peaceful facade, intensive developments have happened over the years, transforming Seletar into a vibrant aerospace business park. Today, the 320-hectare Seletar Aerospace Park (SAP) is home to major aerospace names such as Airbus, Bombardier, GE Aviation, Pratt & Whitney and Rolls-Royce, as well as home-grown giant, ST Engineering Aerospace and several local enterprises. In this continuation of a series of essay commissioned by *Aerospace Singapore*, Mr Goh Yong Kiat traces Seletar's growth to an aerospace centre.

With Singapore's independence in 1965, Seletar, a former British Royal Air Force (RAF) air base, was quickly identified by the Singapore Government as a site for the establishment of an aviation business cluster. Consultancy studies carried out in 1969 contained recommendations to develop Seletar as the initial base for a new aerospace industry in the region.

The same year also saw the establishment of the first aerospace venture in Seletar – Singapore General Aviation Services (SGAS). The company was 60% owned by the Singapore Government and 40% owned by Hawker de Haviiland of Australia. The new company provided MRO services for private and commercial aircraft operators in the Southeast Asia region as well as in flight training.

Aerial shot of the Heli Orient headquarters at Seletar Airfield from the company's first brochure. The facility comprised sales and administrative offices, a spare parts distribution centre, component overhaul workshops, a repair and maintenance hangar, and an electronics department. Photo: Heli Orient Facebook Page

Next, Heli Orient, wholly owned by Britain's Anglo-Thai Corporation, was established at Seletar's East Camp. The company became one of the largest aircraft sales and support organisations in Asia. It was the dealer for major aircraft manufacturers such as Bell, Britten-Norman and Cessna. At Seletar's West Camp, Anrite Aviation became the dealer for the Piper Aircraft.

On 11 March 1970, Lockheed Aircraft Corporation of America announced the signing of a six-year agreement with the Singapore Government to perform heavy maintenance of the Singapore Air Defence Command (SADC) aircraft. A new Singapore company, Lockheed Aircraft Service Singapore (LASS) was set up for this at West Camp.

These ventures were made possible by utilising ex-RAF maintenance facilities acquired on

In 1984, an RSAF Skyvan was leased to Tradewinds, an SIA subsidiary. The aircraft operated between Seletar and Pulau Tioman as "9V-BNJ". Photo: Goh Yong Kiat

long-term lease from the Singapore Government. The vast amount of existing infrastructure in the form of hangars and workshops, and foothold made by aircraft companies, was to become the nucleus for the development of a dedicated aerospace industrial cluster.

In 1968, Seletar Airport was handed over to the Department of Civil Aviation (DCA), the predecessor of the Civil Aviation Authority of Singapore (CAAS). Due to its low intensity air traffic, the airport was deemed suitable for flying club activities and flight training schools. The renamed Republic of Singapore Flying Club moved back to Seletar from Paya Lebar in 1974. In 1981, the government-sponsored Junior Flying Club moved to East Camp. Renamed as the Singapore Youth Flying Club (SYFC) in 2001, it later shifted to a new facility in West Camp in 2003 and remained as the most active tenant of Seletar in flying operations. In 1988, the Singapore Flying College, a wholly owned subsidiary of Singapore Airlines (SIA), was set up and called Seletar its home.

On the MRO front, the Singapore Aerospace Maintenance Company (SAMCO) was set up in 1975 by the government to perform MRO services for the Republic of Singapore Air Force (RSAF - formerly SADC). SAMCO grew from strength to strength and was later reorganized under the umbrella of Singapore Aircraft Industries, which is today ST Engineering Aerospace, the aerospace arm of ST Engineering.

Seletar also saw the birth of a new Singapore airline. Tradewinds, the forerunner of SilkAir, inaugurated its scheduled flight on 8 June 1984 from Seletar Airport to Pulau Tioman using a Skyvan leased from RSAF. A subsidiary of Singapore Airlines, Tradewinds provided 10 scheduled flights a week. This service was discontinued in 1991 when it was replaced by a MD-87 twinjet operating from Changi Airport.

With the growth in business aviation, Seletar saw the entry of business aviation FBO and MRO, Jet Aviation in 1995. To support the development of regional airlines, Fokker Services Asia (FSA) was established in Seletar in 1997.

By this time, the ageing facilities in Seletar were in dire need of renewal and modernisation. All the major MROs were being housed in ex-RAF hangars and workshops, and the airfield services needed to be updated to the latest technological standards. At the same time, the other aerospace industrial estates in Singapore – in Loyang and Changi North – were also running out of space for further growth.

Then, came the announcement of the Seletar Aerospace Park (SAP) Masterplan in 2006. This was timely in addressing the above concerns and signaled a clear aim of attracting new investments for the Singapore aerospace industry.

The SAP masterplan consisted of comprehensive plans for the upgrading of Seletar Airport into a modern airport, extensive improvements to the aerodrome infrastructure, land allocation for the development of the aerospace industry, improvements to the road infrastructure and conservation of ex-RAF colonial bungalows for F&B and lifestyle services.

The old Seletar Air Traffic Control tower in the background, with a Singapore Flying Club Cessna 172R in the foreground. Photo: Goh Yong Kiat

A colonial steel lamp post along West Camp Road provides a nod to Seletar's past and hosts directional indicators to the various facilities in SAP.

Meanwhile, CAAS was reorganised and with the formation of Changi Airport Group (CAG) and corporatisation of Singapore Changi Airport in 2009, Seletar Airport operations came under the management of CAG.

The implementation of the SAP masterplan, helmed by JTC Corporation, together with the Singapore Economic Development Board (EDB) and CAG, saw an increase in the runway length at Seletar Airport. With its completion in 2011, the lengthened runway allowed the operations of aircraft up to the size and weight of the Boeing 757 into Seletar. The expansion also saw an increase in the number of aircraft parking bays. A new ATC Tower and Fire Station became operational in 2012, followed by a brand new Seletar Airport Terminal in 2018.

Most of the military units which were in Seletar were also progressively moved out and by mid-2000, the military security checks at the entrance to Piccadilly Circus was removed. A new main entrance to SAP was established, allowing convenient vehicle entry from the new Tampines Expressway.

Promoting SAP as an integrated aerospace hub attracted major players in the industry to set up new facilities in Seletar. Rolls-Royce led the way with its first manufacturing plant outside United Kingdom (UK) in 2012, followed by Bell Textron Asia in 2012 and Bombardier of Canada in 2014.

The local scene was no less busy. Eurocopter Southeast Asia (ESEA) was the first to move into their new building when it relocated its facilities from Loyang to East Camp in January 2011. Fokker Services Asia (FSA) and Hawker Pacific moved into their new facilities at West Camp, becoming neighbours with Jet Aviation and ST Engineering Aerospace.

ST Engineering Aerospace upgraded and expanded its facilities with new hangars. A significant milestone was the set-up of the Boeing 757 passenger-to-freighter conversion line in Seletar to meet two contracts from a major customer for 119 aircraft, of which 42 were completed in their Seletar facilities. Local start-ups such as MAJ Aviation and WingsOverAsia boosted the General Aviation scene. The launch of two complexes, JTC Aviation One and Two provided offices and space for aerospace companies providing services in fixed-based operations, aircraft component repairs, supply of aircraft parts, chartering, freight forwarding and fleet management.

The combination of these developments made SAP an important integrated aerospace hub. Today, while some of the companies mentioned have since been renamed, expanded, merged, or closed, SAP stands as an icon in Singapore's pursuit of growing its aviation industry. With its transformation from a coastal swampland to a military airfield and now a vibrant aviation hub, the Seletar Airport story continues.

Nestled within Seletar Aerospace Park is the Hampstead Wetlands Park, developed by JTC and Nparks as a a green sanctuary and a place for rest and recreation for the surrounding community of SAP.

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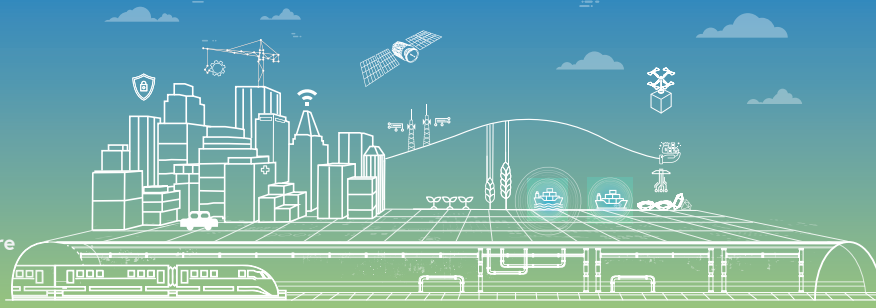

Geospatial & Location Intelligence Solutions for Asia - Underground, Land & Sea to Sky

Geo Connect Asia (GCA) 2022 seeks to address the increasing interplay between ground and satellite technologies, artificial intelligence (AI) and data analytics, amid growing momentum towards a Geospatial 4.0 world - *Southeast Asia's flagship geospatial and location intelligence event grows to host fast-developing industry solutions*

Featuring Industry Profile

UAV Asia 2022

With ever-expanding opportunities, the industry is being transformed into an exciting space. The addition of UAV solutions as a complementary industry in GCA 2022 will enable solution providers to experience first-hand a full range of exciting industry developments in Singapore. We would like to invite AAIS members to be part of this business platform reaching out to the key industry communities.

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INDUSTRIAL TRANSFORMATION ASIA-PACIFIC 2021

ITAP returned as a hybrid event with over 11,000 in-person and online attendees across three days

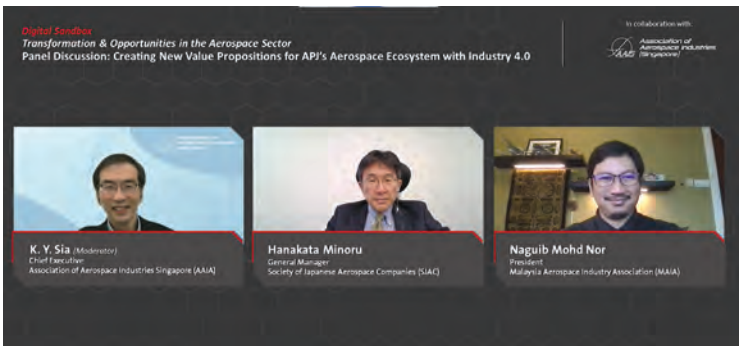
The 4th edition of the Industrial Transformation Asia-Pacific (ITAP) 2021; organised by Constellar and Deutsche Messe, successfully concluded on 24 November 2021. The ITAP 2021 physical exhibition was the largest in-person exhibition in Singapore since the beginning of the COVID-19 pandemic, hosting over 3,600 in-person attendees at Singapore EXPO. It was also the pilot event that implemented the Vaccination-Differentiated Safe Management Measures + Test (VDS+Test) protocols in Singapore.

The 4 'S' of Change in Advanced Manufacturing

The event's Guest-of-Honour, Deputy Prime Minister Mr Heng Swee Keat, made a presence on the first day on 22 November 2021, where he delivered the opening address. In his speech, Minister Heng highlighted how the pandemic had shifted the spotlight from "where we manufacture" to "how we manufacture". He also elaborated on the four "S" of change in advanced manufacturing – namely Smart supply chains; Sustainable production; Swift innovation; and Secure machines.

These four factors were among the topics discussed at the ITAP event which featured over 150 content sessions by more than 120 speakers. The sessions also covered the latest in manufacturing technologies, key industry developments, strategic regional developments, and regional government initiatives on Industry 4.0 (I4.0).

Participants who are unable to attend in person, were able to access the ITAP CONNECTED digital event platform. The platform provided virtual attendees with a comprehensive exhibition e-showcase and networking opportunities through AI-powered business matching. There was also a "Digital Sandbox", where country partners shared insights, case studies and perspectives on how I4.0 solutions transformed businesses. The segment also featured a virtual I4.0 factory walk-through.



Digital Sandbox webinar featuring panellists from aerospace industry associations in the Asia-Pacific region

Transformation & Opportunities in the Aerospace Sector

AAIS collaborated with ITAP 2021 to present a Digital Sandbox webinar, 'Transformation and Opportunities in the Aerospace Sector', on 24 November 2021. The event was moderated by AAIS Chief Executive Mr Sia Kheng Yok and featured a panel discussion with Mr Hanaka Minoru (GM International Affairs, Society of Japanese Aerospace Companies) and Mr Naguib Mohd Nor (President, Malaysia Aerospace Industry Association). The panel shared its view of the pandemic's impact on industry and early signs of recovery. It also discussed how i4.0 transformation was helping to shape the recovery and the role industry associations were playing. This was followed by a presentation by Mr Shawn Lee (Head of Digital Solutions APAC, Airbus Group) on the progress of Airbus' Skywise digital service and its impact on customers.

Overall, ITAP 2021 attracted more than 11,000 attendees physically and digitally from more than 70 countries across three days. The event hosted some 143 exhibitors from 11 countries, including 5 national pavilions from Singapore, China, Germany, Indonesia, and Malaysia.

The next edition of ITAP is set to be held from 18 to 20 October 2022.

AAIS ANNUAL GENERAL MEETING 2021

The 19th Annual General Meeting of Association of Aerospace Industries (Singapore) (AAIS) was held virtually on Thursday 28 October 2021 from 10.30am to 11.35am. The event saw the attendance of more than 60 representatives from the AAIS membership.

Opening Remarks by Outgoing President

In his opening remarks, outgoing President Mr Philip Quek noted that the prolonged Covid-19 pandemic and resulting economic crisis had a significant impact on the aerospace and aviation industries in Singapore. Nonetheless, the industry was starting to see signs of recovery, with the aerospace segment marking growth of 21% in the second quarter of 2021, from a low base of MRO activities in the previous year. He said that a "bumpy" road to recovery was expected and anticipated further challenges in the post-pandemic landscape. Yet, the long-term outlook for aerospace remained positive, and members were called upon to strategise and plan for growth. He highlighted that to position for the future, the Association was gearing up to address three areas – sustainability, transformation, and advocacy.

Mr Quek also announced that he would be stepping down from the AAIS presidency with the completion of his third term as the elected President of AAIS. He thanked the membership for the privilege and honour and expressed his confidence that the new Management Committee would build upon previous successes.

Endorsement of Reports and External advisors

Honorary Secretary, Ms Lim Hee Joo, presented the Association's key activities in FY2020/21. This was followed by a report by Honorary Treasurer, Mr Philip Sung, on the audited financial statements of AAIS for the year ending 30 June 2021.

Members present endorsed the FY2020/21 Annual Report and Financial Statements and approved the reappointment of Mr Paul Sandosham of Clifford Chance as the Honorary Legal Advisor and Ernst & Young as the Honorary External Auditor.

Recognition of Contributions to the Industry during the COVID-19 crisis

The Association and its members expressed their appreciation to key partners who had played a pivotal role in guiding and supporting the industry and AAIS through the challenging COVID-19 crisis:

1. **Mr Robin Thevathasan**, Chair of the AAIS COVID-19 Taskforce
2. **Mr Tan Kong Hwee**, Executive Vice President at the Singapore Economic Development Board
3. **Ms Glory Wee**, former Director of the Aerospace, Marine & Offshore Urban Solutions at the JTC Corporation
4. **Mr Ho Chi Bao**, former Director of Advanced Manufacturing at Enterprise Singapore

Appreciation for the 12th Management Committee 2019/21

The Association also recorded its appreciation to the 12th Management Committee for its leadership through the worst of the pandemic. Two long-serving MC members who stepped down at the AGM were recognised:

Mr Robin Thevathasan (right), receiving the appreciation token

1. **Mr Philip Quek** (AAIS President - September 2015 to October 2021)
2. **Mr Philip Sung** (AAIS Honorary Treasurer - September 2017 to 2019 and 2020 to 2021; Asst Honorary Treasurer - 2019 to 2020; Committee Member - 2015 to 2017)

Appointment of the 13th Management Committee 2021/23

Finally, the election results for the 13th AAIS Management Committee (MC) were announced. The twelve elected MC members will be serving a two-year term (until the AGM in 2023).

In his closing remarks, newly elected President Mr Wong Yue Jeen extended his appreciation to

Ms Glory Wee (left), receiving the appreciation token

the 12th Management Committee. He spoke of the following key priorities of AAIS in the coming months:

- Working with industry, partners and government agencies to execute action plans towards developing Singapore as a sustainable aerospace hub;
- Leveraging on the anticipated Industry Transformation Map 2.0, to continue working with and facilitating member companies in their digital and technological transformation drives;
- Enhancing supply-chain connectivity for Singapore companies to the global marketplace, harnessing synergies between large OEMs and smaller SMEs through partnership and collaboration;
- Contributing to global standards development through participation in ICCAIA and IAQG; and
- Advocating for the interests of the aerospace community, better engagement with and bringing higher value-added services to the AAIS membership.

President said that he looked forward to working with the members to shape, design and innovate for the advancement of the aerospace industry.

AAIS Management Commitee 2021/23

(as of 31 December 2021)

President
Wong Yue Jeen
SIA Engineering Company

1st Vice-President
Richard Wong
Pratt & Whitney

2nd Vice-President
Mads Bondergaard
Airbus

Honorary Secretary
Lim Hee Joo
Wah Son Engineering

Honorary Treasurer
Desmond Goh
Eaton Industries

Asst. Hon. Secretary
Ekkehard Pracht
Liebherr-Singapore

Asst. Hon. Treasurer
Yap Siok Leng
Meggitt Aerospace Asia Pacific

Committee Member
Rahul Shah
AAR International Inc

Committee Member
Mathieu Pere
Safran Electronics and Defense

Committee Member
Philip Ang
Singapore Aero Engine Services

Committee Member
Kevin Chow
Thales

Committee Member
Oliver Chamberlain
Rolls-Royce

Co-opted Member
Kenneth Low
Singapore Institute of Technology

Co-opted Member
William See
Temasek Polytechnic

Chief Executive
Sia Kheng Yok

AEROSPACE PARTNERS' GOLF TOURNAMENT 2021

The Aerospace Partners Golf Tournament 2021 was held on Friday 29 Oct 2021 at Garden Course, Tanah Merah Country Club, after a year's hiatus.

The tournament attracted 92 golfers who enjoyed the fine weather, and novelty games with prizes such as aircraft models, tiger beer, gin and whisky. Roving buggies ensured that beer, 100-Plus, bananas and chocolate bars were never in short supply. Players also generously participated in the mulligan raffle. It was an all-in-all roaring good time despite the constraints of safe management restrictions.

All net proceeds from the tournament were donated to the Cerebral Palsy Alliance Singapore. On behalf of the APGT Organising Committee, we thank the participants and sponsors, for their generosity and support!

Champion:
Johnny Eng 36 points (ocb)

1st runner-up:
Paul Hallam 36 points

2nd runner-up:
Edwin Khew 36 points (ocb)

Team Champions:
- Matius Fratiou
- Peter Lundberg
- Christopher Harvey
- Mehdi Sbais

Nearest-the-pin (Hole 11)
- 1st prize: James Lye
- 2nd prize: Danny Soong

The longest drive (Hole 13)
- Above 50 years old: James Lye
- Below 50 years old: Marc Paquet

YEAR-END HOST NETWORKING 2021

To usher in the spirit of the festive season, AAIS organised a year-end virtual networking get together for members on the evening of 10 December 2021. Our new President, Mr Wong Yue Jeen, hosted a conversation with newly-elected management committee members, Mr Oliver Chamberlain of Rolls-Royce Singapore and Ms Yap Siok Leng of Meggitt Aerospace Asia Pacific. This was followed by networking in smaller groups before a toast to close the year.

A special acknowledgment to our guests, Mr David Waller of EASA and Ms Lim Li Khee of ESG for joining us.

We were also glad to welcome members of our Panel of Experts, Mr Jeremy Chan, Mr Soh Chee Siong, Mr Mervyn Sirisena and Mr Michael Daniel. It was a delighted to have our newer members join us, including Mr Kevin Ng of Quebec Government, Mr Joshua Ng of Alton Aviation, Mr Cai Hounan of Additive Flight Solutions, and Mr Fergus Lopez of Diethlem Keller Aviation.

We welcome members and the community to join us for the next networking session in the first quarter of 2022. Please subscribe and look out for our newsletters for more information.

SINGAPORE STOPOVER: ZARA RUTHERFORD

A Belgian-British teenager on a quest to become the youngest woman to fly around the world, arrived in Singapore for a stopover on 24 December 2022 at 2.45pm, right before the start of a heavy downpour. Flying in a bespoke Shark Aircraft of Czech-Slovak origin, one of the world's fastest ultralight aircraft, Zara Rutherford's arrival at Seletar Airport takes her one step closer to completing the ambitious journey.

Through her audacious journey, 19-year-old Zara aims to create awareness and inspire more girls and young women to take up STEM and pursue careers in aviation. While in Singapore, Zara took the opportunity to engage with more than a hundred students and aviation enthusiasts, through a webinar co-organised by Association of Aerospace Industries (Singapore) (AAIS), the Embassy of the Kingdom of Belgium, the Embassy of the Czech Republic, and Women in Aviation International Singapore Chapter (WAI SG).

Singapore Member of Parliament and former RSAF helicopter pilot Ms Poh Li San, the Belgian Ambassador HE Colette Taquet, and Czech Ambassador HE Michaela Fronkova congratulated Zara on her achievements, echoing the importance of the aviation and aerospace industries and supporting the advancement of women in these sectors. The intrepid teenager spoke about her adventure and aspirations, sharing the challenges and wonderful experiences from her unique and daring flying expedition.

Representatives from AAIS, the Belgian and Czech embassies, and WAI SG warmly welcoming Zara on her arrival in Singapore. Photo: Aerophotoworks for Shark.Aero

INNOVATION IN AIR TRANSPORT

AAIS and Starburst Aerospace jointly organised the 'Innovation in Air Transport' webinar held on 11 November 2021. Mr Julius Yeo of Starburst introduced the session with a briefing on the progress of the Singapore Aviation Accelerator (SAA) which has graduated eight start-ups from its inaugural cohort and is working with them on commercialization.

The accelerator aims to identify up to 13 start-ups a year for investment, business development and talent acquisition, putting them through a 90-day bootcamp. Focus areas include sustainability and green aviation, digitalization, data security, air cargo and logistics, enhancing of operations and infrastructure, and enhancing the passenger experience, and other technologies with potential synergies.

A highlight of the webinar was the presentation by Mr Paul Brady of CarbonClick, which has developed a carbon offset solution for airports, airlines and e-commerce platforms. While carbon offsetting has been around for some time, CarbonClick has simplified the process for consumers and removes the complexity of navigating the market to identify high quality, meaningful and verified projects.

This presentation was followed by a panel discussion with Mr Karthikeyan T. of SIA Engineering Company and Mr Alex Kasinec of Evitado Technologies, a start-up from the first cohort of the Singapore Aviation Accelerator. Alex explained that Evitado was set up to automate airport ground operations to improve situation awareness, safety and efficiency. Evitado is working on a ground collision avoidance solution with SIA Engineering Company.

We thank all speakers and participants for a fruitful, enlightening and inspiring event. To find out more about the SAA, visit www.aviation-accelerator.com.

9100-SERIES STANDARDS REVIEW SESSIONS

The Singapore Aerospace Quality Group (SAQG), a community under the umbrella of AAIS, conducted two 9100-series standards review sessions on 11 & 12 January 2022, with the active participation of representatives from Singapore-based companies that are certified to the 9100-series quality management system standards. The participants, who represented various sub-sectors, including airframe, avionics, component, defence, engine and special processes, gave their views based on experiences from implementing the 9100 standards within their organisations.

The International Aerospace Quality Group (IAQG) produces the AS9100 standard as a set of guidelines used by the aerospace industry for implementing a Quality Management System. The standard is modified for the aerospace industry from the internationally recognised standard ISO 9001. The ISO 9001 standard is reviewed every five years to determine what changes, if any, are required to keep the standards up-to-date and relevant. IAQG supports these changes and considers additional requirements that reflect the needs of the aerospace industry today to keep the AS9100 series of standards updated.

The comments gathered during these sessions will contribute to upcoming updates to be made by IAQG. We thank the participants for their commitment and contributions. There will be similar sessions in the near future, and we welcome interested companies/representatives to contact quality@aais.org.sg to be part of the SAQG.

RELEASE OF THE SINGAPORE AVIATION INDUSTRY DIRECTORY 2022

The Association of Aerospace Industries (Singapore) is proud to announce the release of the Singapore Aviation Industry Directory (SAID) 2022.

SAID has been in publication since 2001 and is well-established as a one-stop reference for overseas and local investors, as well as outsourcers and procurers of the aviation industry. The directory is supported by the Civil Aviation Authority of Singapore, Singapore Economic Development Board and Enterprise Singapore. It contains a comprehensive listing of Singapore-based companies in aerospace manufacturing and MRO, aftermarket services, training, research and consultancy, solution providers, and others offering aviation-related products and services.

SAID is circulated to overseas and local aviation companies, airlines, outsourcers, and procurers in the aviation industry through AAIS networks and via supporting government agencies. It will be distributed to all exhibitors, as well as visitors to the Singapore pavilion at Singapore Airshow 2022. The directory is a useful tool to explore the diverse capabilities of the Singapore aviation and aerospace industries.

Please visit us at Booth AC01 to get a copy. We look forward to facilitating mutually beneficial partnerships and collaboration.

OUR NEW MEMBERS

ORDINARY MEMBERSHIP
Additive Flight Solutions Pte Ltd
Additive Flight Solutions (AFS) is a joint venture between SIA Engineering Company (SIAEC) and Stratasys. AFS is in the business to provide certified aviation parts and tooling for aerospace MROs utilizing additive manufacturing.

ORDINARY MEMBERSHIP
Alton Aviation Consultancy Singapore Private Limited
Alton Aviation Consultancy is a boutique aviation consulting firm that is highly experienced and proudly independent. We bring deep domain expertise and hands-on collaboration to clients across commercial, financial and technical disciplines. Our global footprint and unparalleled relationship network span the aviation industry.

ORDINARY MEMBERSHIP
Diethelm Keller Aviation
Diethelm Keller Aviation (DKA), a wholly owned subsidiary of the Swiss based Diethelm Keller Group, is one of the top certified suppliers of aircraft galley inserts to airlines and airframe manufacturers worldwide. DKA has manufacturing facilities in Singapore and Suzhou, China.

ORDINARY MEMBERSHIP
Flying Colours Corp Asia Pte Ltd
Flying Colours Corp Asia provides aircraft cabin interior maintenance/repairs services, including inspection and repairs onboard aircraft and in workshop, and repairs to interiors. Located within the Bombardier Service Centre at Seletar Airport in Singapore, we opened the doors in 2014 and have continuously developed our reputation for quality and professionalism since then.

ORDINARY MEMBERSHIP
Topcast Aviation Singapore Pte Limited
TOPCAST is your aviation partner. We are not only accommodating your needs, but also working with you for the best customized solutions to exceed your expectations. We offer exceptional OEM and aftermarket aircraft parts, equipment and repair services for a broad range of aircraft types.

ASSOCIATE MEMBERSHIP
Donald McArthy Trading Pte Ltd
Donald McArthy Trading (DMT) is a leader in the provision of mutilation and disposal services for end-of-life parts from the aviation, defence and power generation MRO industries. DMT is also engaged in recycling and processing services for metal materials arising in the manufacturing of components for these sectors.

ASSOCIATE MEMBERSHIP
Quebec Government Office in Singapore
The Québec Government Office in Singapore carries out a primarily economic mandate by promoting Québec expertise in sectors of common interest as well as by identifying business opportunities and partnerships for Québec companies, institutions and organisations wishing to position themselves in Singapore and Southeast Asia in general.

ASSOCIATE MEMBERSHIP
RHTLaw Asia LLP
RHTLaw Asia offers a different perspective on client experience and commercial thinking. As a leading regional law firm headquartered in Singapore, clients can expect intelligent and innovative solutions from a team that is attuned to the nuances of doing business in Asia. We provide access to over 2,000+ lawyers in 14 jurisdictions through ASEAN Plus Group (APG), a close-knit regional law firm network.

AAIS TRAINING CALENDAR

The Professional Development arm of AAIS offers a spectrum of training and development programmes throughout the year. These range from general or soft-skill courses to industry-specific certification courses.

AEROSPACE & INTERNATIONAL STANDARDS/CERTIFICATION

Understanding & Implementing AS 9100:2016 QMS
24 February 2022#
17 March 2022
21 April 2022#

AS 9100:2016 Internal Auditor Course
24 & 25 February 2022#
17 & 18 March 2022
21 & 22 April 2022#

Understanding & Implementing AS 9120:2016 QMS
24 February 2022#
17 March 2022
21 April 2022#

AS 9120:2016 Internal Auditor Course
24 & 25 February 2022#
17 & 18 March 2022
21 & 22 April 2022#

PROBITAS AS/EN/JISQ 9100:2016 Lead Auditor Course#
7 to 11 March 2022

ISO 9001:2015 Internal Auditor Course#
10 & 11 February 2022
3 & 4 March 2022
13 & 14 April 2022

ISO 9001:2015 Lead Auditor Course#
14 to 18 February 2022
7 to 11 March 2022
4 to 8 April 2022

ISO 14001:2015 Internal Auditor Course#
10 & 11 February 2022
13 & 14 April 2022

IRCA ISO 14001:2015 Lead Auditor Course#
14 to 18 February 2022
4 to 8 April 2022

ISO 45001:2018 Internal Auditor Course#
3 & 4 March 2022

IRCA ISO 45001:2018 Lead Auditor Course#
7 to 11 March 2022

ISO 9001:2015 + ISO 14001:2015 + ISO 45001:2018 QEHS Internal Auditor Training#
21 to 23 March 2022

ISO 22301:2019 Internal Auditor Training#
12 & 13 April 2022

IRCA/CQI Certified ISO 22301:2019 Lead Auditor Training#
21 to 25 February 2022

ISO 27001:2013 Internal Auditor#
10 & 11 March 2022

IRCA/CQI Certified ISO 27001:2013 Lead Auditor Training#
28 February to 4 March 2022
14 to 18 March 2022

ISO 31000:2018 Introduction#
22 April 2022

ISO 31000:2018 Implementation#
14 & 15 February 2022

IRCA/CQI Certified ISO 50001:2018 Lead Auditor Training#
21 to 25 February 2022

ISO 14064 - Part 1: Quantification & Reporting: GHG Emissions & Removals#
14 & 15 February 2022
14 & 15 March 2022
18 & 19 April 2022

Integrated ISO 14064 - Part 1 & ISO 14067 GHG & CFP Quantifier Course#
21 to 23 February 2022
21 to 23 March 2022
25 to 27 April 2022

ISO 14067 Carbon Footprint of Products: CFP Quantification & Communication#
17 & 18 February 2022
17 & 18 March 2022
20 & 21 April 2022

INDUSTRY PRACTICES

International Suspected Unapproved Parts – Identifying, Detection, and Resolution#
11 to 13 April 2022 (4 half weekdays)

EASA REGULATIONS

EASA Part 21 Subpart J - Design Organisation Approvals (DOA)#
21 to 24 March 2022 (4 half weekdays)

EASA Part 21 Initial Airworthiness#
4 to 7 April 2022 (4 half weekdays)

Airworthiness Accountable Manager#
8 & 9 March 2022 (2 half weekdays)

NADCAP

Introduction to Pyrometry
28 & 29 March 2022

QUALITY TOOLS & TECHNIQUES

Root Cause Analysis (RCA)
10 & 11 March 2022

Supplier Quality Audit (SQA)
24 & 25 February 2022
21 & 22 April 2022

Failure Mode & Effect Analysis (FMEA)
21 & 22 February 2022
25 & 26 April 2022

Supplier Quality Management (SQM)
24 & 25 March 2022

Measurement System Assessment (MSA)
28 & 29 March 2022

SAFETY

Modern Safety Management (MSM)#
7 to 11 February 2022
7 to 11 March 2022
4 to 8 April 2022

Bowtie Methodology Training#
14 & 15 February 2022
17 & 18 March 2022
14 & 15 April 2022

Process Safety Management (PSM)#
9 to 11 February 2022
14 to 16 March 2022
11 to 13 April 2022

SPECIAL PROCESSES (NEW)

NDT Level II - Penetrant Inspection Applications for Aerospace Manufacturing Qualification
29 March to 1 April 2022

NDT Level II - Magnetic Particle Inspection Applications for Aerospace Manufacturing Qualification
4 to 7 April 2022

Welding Applications for Aerospace Qualification
11 to 13 April 2022

Shot Peening Applications for Aerospace Qualification
20 to 22 April 2022

Flap Peening Applications for Aerospace Qualification
25 to 27 April 2022

Legend:

#Virtual Instructor Led Training (VILT)

*Information is accurate at time of printing.
AAIS reserves the right to re-schedule or cancel any course due to unforseen circumstance.

For enquiries, contact Jen Ng at +65 6922 1788 or email us at training@aais.org.sg

Association of Aerospace Industries (Singapore)

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.
- The publication is widely distributed to the international aerospace communities, at various airshows and aviation industry exhibitions.
- Join us in the 9th edition of the SASD now! Standard advertisement rates apply.

Get a marketing package that suits your needs and budget today!

For booking or enquiries, please contact

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