

AEROSPACE WORKFORCE OF THE FUTURE





As we enter a new decade, it is timely that we reflect on where the aerospace industry is headed, how it is changing and what this means for the workforce. The Singapore aerospace industry has done consistently well. A year-on-year growth of 11% was registered in 2018, with a record output of S\$11 billion, according to the Economic Development Board (EDB). This was achieved against the backdrop of strong long-term growth prospects in the Asia-Pacific, tempered by increasing geo-political and geo-economic risks.

SINGAPORE'S UNIQUE TRIPARTITE ALLIANCE

The Singapore aerospace industry has long been built on a unique alliance between industry, the workforce (represented by the unions), and a proactive government. This alliance continues to be important in aligning interests and enabling nimbleness in our collective response to change. Agencies such as EDB, JTC, Enterprise Singapore, SkillsFuture Singapore and Workforce Singapore, have collectively brought growth opportunities into Singapore, and supported the development of essential infrastructure and skills upgrading. The Civil Aviation Authority of Singapore (CAAS) underpins this by providing a strong and forthcoming

regulatory environment.

In 2017-8, the Air Transport and the Aerospace Industry Transformation Maps were announced by lead agencies, CAAS and EDB respectively. These maps were developed in consultation with industry and unions, and articulate strategies for Singapore to capture the projected growth in aviation. To illustrate, the Aerospace map highlighted 4 key initiatives - pursuing operational excellence, driving innovation in emerging technologies, equipping manpower with relevant skills and recognizing the role of industry associations. Complementing this, the Aerospace SkillsFuture Framework was launched as a road map to "future-proof" jobs in the industry. Specific skillsets were highlighted to ensure that companies and training institutions are aligned with key industry trends.

DIGITAL TRANSFORMATION

Certain factors are driving industry change and in turn, the future of jobs and the workplace. Airlines, both low-cost and full-service carriers, are actively looking to maximise aircraft availability and corporate profitability. As aircraft maintenance is a major factor in their calculations, the industry has been very focused on building new digital, analytical and predictive maintenance

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The Advanced Remanufacturing and Technology Centre’s Model Factory @ ARTC demonstrates how condition monitoring can provide data for predictive model and optimisation.



capabilities to optimise maintenance, repair and overhaul (MRO). A quick glance at recent corporate moves reveals how MRO companies have been jockeying to position themselves as providers of such digital solutions to

airlines. SIA Engineering Company, for example, is cooperating with Safran to develop predictive maintenance capabilities. ST Engineering Aerospace has a Smart MRO office that is driving digital solutions across the company.

Amongst other things, these companies hope to shorten MRO turn-around time with predictive and prescriptive maintenance powered by in-flight data analytics. Maintenance hours can be significantly reduced by using artificial intelligence (AI) to predict faults and prescribe optimum repair procedures, even while the aircraft is in flight. The repairs can then be prepared and ready when the aircraft lands. In a first-of-its-kind demonstration, Air New Zealand successfully ordered a 3D printed replacement part from ST Engineering Aerospace, that was printed and installed in Los Angeles

when the plane arrived.

Productivity is being enhanced with greater automation of repair processes in the workshop. Engine-maker Pratt & Whitney is leading change in its Singapore MRO operations. Mr. Richard Wong, General Manager of Pratt & Whitney Turbine Overhaul Services said, “Our MRO companies in Asia-Pacific are increasingly adopting technology advancements such as predictive maintenance, driven by in-flight data analytics. This is to shorten turnaround times and add value to customers with improved engine reliability, increased time on-wing and reduced cost of ownership.” He added, “Turbine Overhaul Services, for example, has introduced process digitalisation, AI algorithms and automation to meet today’s demands and anticipate tomorrow’s customer needs.”

In particular, the company has introduced a proprietary Piece Part

Inspection technology based on AI algorithms. This technology assists inspectors in detecting surface defects automatically, enabling productivity gains of up to 80%. Laser cladding technology improves welding accuracy (and reduces re-work rates) and electron beam physical vapour deposition improves parts durability.

CHANGES IN AIRCRAFT TECHNOLOGY

The recent decades have been characterised by significant strides in aircraft technology and the introduction of new aircraft types. New designs or design changes in aerospace components must undergo rigorous numerical analysis and testing. Computer Aided Design and Finite Element Analysis are standard tools used to assist in the creation, modification, analysis or optimisation of a design. To produce and test new designs, the manufacturing capabilities and special processes (such as anodising, heat treatment, non-destructive testing, thermal spray coating, welding and additive manufacturing) may need to be further developed and meet international specifications (e.g. Nadcap certifications).

Modern materials such as composites, are increasingly being used in next generation aircraft and components. The popularity of composites stems from their high strength and stiffness-to-density ratios. This means that parts produced from composite materials can be just as strong as traditional materials but much lighter. The usage of composites in commercial aircraft has surged in recent years, and the trend is expected to continue. Aircraft made with lightweight materials will have lower fuel consumption and hence, reduced carbon emissions.

Competencies in design,

engineering analysis, new repair techniques and new materials are being developed in the Singapore industry. This is exemplified by Composite Cluster Singapore (CCS), a Singapore-based company specialising in engineering services related to advanced composite materials. In April 2018, CCS spearheaded the creation of the Composite Application Center (CAC) – to coordinate a Singapore-based consortium of composite businesses and research institutions. The CAC is able to provide the whole value chain of composites solutions, from early-stage feasibility assessments to manufacturing of components.

CCS is actively contributing to the future of flight, through its activities in electric propulsion aircraft, the urban air mobility and unmanned aircraft sectors. For example, CCS designed the wings and belly fairings for 'Alice', an electric-powered passenger aircraft under development by Eviation Aircraft. Unveiled at the Paris Airshow in 2019, the 9-passenger aircraft with a range of 1,000 km and cruise speed of 240 knots was built with 95% composite materials, and powered by three electric motors.

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Laser-cladding technology deployed at Pratt & Whitney Turbine Overhaul Services improves accuracy

FEATURE



Students are encouraged to engage with representatives from Singapore aerospace companies at industry career exhibitions and open houses

(It is noteworthy that the wedge-tail assembly was also designed and built by a Singapore-based company, Barrett Aerospace. See InProfile article in Aerospace Singapore Vol. 12 No. 3.)

WORKFORCE OF THE FUTURE

These interesting developments are leading to changes in the nature of work and the workplace, and the attitudes and skills needed by the workforce. This comes on top of fundamental changes in our population and workforce demographics. A consistently low fertility rate means the average age of the working population has risen. We are also blessed with a longer life expectancy and people are able to contribute for longer in the workforce. According to the Singapore Ministry of Manpower, the median age of the resident labour force was 44 in 2019. The same report also indicates that 57.6% of the resident labour force in

2019 possessed a degree, diploma or professional qualification. Indeed, with Singapore's status as an advanced economy, younger persons entering the workforce are now better educated and have different expectations and attitudes compared to their seniors.

How can we enable the workforce to be more comfortable with the continuous evolution of new technologies and associated changes in job nature? How will the workforce acquire new skills and adapt to an increasingly digital workplace? How do we better harness the experience of older workers and redesign jobs and the workplace to suit? At the same time, how do we engage new entrants to the workforce, who generally have more opportunities and different aspirations? It is often cited that the greatest barrier to industry transformation is not technology, but the readiness of both the workforce and organization to

embrace change.

We may not have all the answers. But crucially Singapore's education has moved to adapt its curriculum to the future. Students are learning digital skills and there are more work-study arrangements available in the tertiary institutions. The Singapore Institute of Technology was set up to help students acquire "real-world skills through applied learning", at the degree level. The Institute of Technical Education has a new strategic roadmap to develop students to be "career-ready, world-ready and future-ready" graduates.

REDESIGNING THE WORKPLACE

Employers have started thinking about redesigning the workplace environment for a more diverse workforce in terms of age, gender, experience and expectations. Bombardier Aerospace Services Singapore is an example of an aerospace employer that has invested in a highly engaged workforce. Mr. Winston Hoo, Director of Operations at Bombardier, explained, "At Bombardier, we are committed to providing a safe environment in which to work." Like many other aerospace workshops of today, Bombardier offers a clean, healthy and comfortable work environment which dispels



Bombardier's global inclusion and diversity strategy focuses on impactful targeted initiatives that will contribute to a cultural shift

outdated and inaccurate perceptions of manufacturing and the MRO industry. The steps taken to create a conducive workplace environment has also enabled the company to build a gender-diverse workforce. "We are pleased to see increasing interest and applications by female tertiary graduates in recent years, especially for the technical positions at Bombardier's Singapore Service Centre. By creating the right environment and cultivating diversity, we are getting people with the right skills and attitude, to build a high performing team," he added.

"A final element in fostering our talent pipeline is development through a performance management process. We engage employees through constructive, continuous feedback throughout the year," Mr. Hoo noted.

Indeed, the advancement in technology and the rapid pace of their adoption necessitates in-employment training programmes for existing workers. Bombardier has put in place an Aerospace SkillsFuture framework that features in-house career progression charts for aircraft technicians and licensed engineers, with lateral and

vertical career tracks. This gives them the opportunity to upskill and chart their own career paths within Bombardier.

Aerospace Component Engineering Services (ACES), recognizes that its ability to retain older workers has been a contributor to its success. With 60% of its employees above the age of 40, the company embarked on job redesign in 2015. This has been an enabler for their ageing workforce. For example, ACES installed a new laser-engraving machine which allowed older workers with hyperopia to emboss serial numbers on metal plates for aircraft components, a task that was previously done manually. The computer screen that comes with the system also displays larger font sizes for ease of operation. Mr. Brian Hunter, General Manager at ACES, noted that older workers who have valuable experience, exemplary attendance records and enthusiasm, have had a positive influence on their colleagues, uplifting overall productivity.

STAYING DYNAMIC AND AGILE

The Singapore aerospace industry has done well in recent decades to stay ahead of the competition. It has started

a conscientious effort to proactively upskill and reskill its workforce, and to redesign jobs and the workplace for the future. At the same time, the industry is working together on initiatives to continue developing the talent pipeline and attracting the next generation of aerospace professionals. Most recently, the Aerospace Student Outreach memorandum of understanding (MOU) was renewed on 15 January 2020 with the involvement of 45 industry players and the Association of Aerospace Industries (Singapore), polytechnics and the Institute of Technical Education (ITE), as well as, government agencies - JTC and the Employment and Employability Institute (e2i). The MOU establishes a framework for student outreach initiatives encompassing internships, events, industry engagement, career fairs and guidance.

Such efforts will place the industry in a good position to retain and attract staff, and to adapt to the rapid pace of technology change. The availability and continuous development of skilled workers is the lifeblood of any industry hoping to compete on the global stage.



Signatories and representatives from participating companies of the Aerospace Student Outreach MOU, with Senior Minister of State for Trade & Industry and Education, Mr. Chee Hong Tat