

Media Release
17 January 2018

Aerospace Industry Transformation Map

*Vision: Singapore - a globally recognised aerospace nation, capable
of design, engineering, production and aftermarket services
for the world's major aircraft programmes*

1. Mr S Iswaran, Minister for Trade and Industry (Industry), launched the Aerospace Industry Transformation Map (ITM) today in conjunction with the 10th anniversary of the Seletar Aerospace Park (SAP) at the JTC Aerospace Networking Night. Developed by a multi-agency team together with industry partners, unions and trade associations, the ITM maps out strategies that will build the aerospace industry of tomorrow. Through the ITM efforts, the industry is expected to achieve a manufacturing value-added of S\$4 billion and introduce 1,000 new jobs by 2020.

The Singapore Aerospace Industry – A Key Sector of Growth for Singapore Economy

2. The aerospace industry is a key sector of growth for Singapore economy, with an average annual growth of 7% in value-added over the past 20 years. In 2016, the aerospace industry achieved a value-add of \$3.35 billion, and employed 21,000 people. 80% of these jobs are filled by locals, and the majority are in high-skilled job roles.

3. Significantly, Singapore has continued to maintain its status as Asia Pacific's leading Maintenance, Repair and Overhaul (MRO) Hub, contributing to 10% of the global aerospace industry's output for MRO. To strengthen our MRO sector further, the Civil Aviation Authority of Singapore (CAAS) has concluded an aviation maintenance agreement and an airworthiness certification agreement with the US

Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA) respectively (please refer to Annex A for more information). Increasingly, Singapore is also being recognised by aerospace companies as a prime location for manufacturing, and offering premium aftermarket services such as cabin modification, fleet management, aircraft leasing and pilot training.

Global Trends Giving Rise to Opportunities for Singapore

4. Looking ahead, the prospects of the aerospace industry remain positive. Increase in global air travel will continue to drive demand for aircraft. Meanwhile, industry reports signal that Asia-Pacific is well on its way to becoming the world's largest aviation market, accounting for almost 40% of the global fleet in 20 years¹. The strong growth in Asia-Pacific presents opportunities across the value chain in manufacturing, MRO and aftermarket industry segments. Aerospace companies will need to broaden their Asian footprint and innovate to address these new market needs.

5. In addition, the emergence of new global trends has brought about growth opportunities for the industry. Aerospace companies are leveraging digital and advanced manufacturing technologies to transform their operations to improve productivity and offer new solutions. In addition, new market segments such as unmanned aircraft systems (UAS) are also emerging. These industry trends will transform existing aerospace jobs, and create new skilled job roles such as robotics engineers, data scientists and additive manufacturing design engineers.

6. To prepare Singapore to capture these growth opportunities, the ITM has identified three key thrusts: pursuing operational excellence, driving innovation in emerging technologies, and equipping Singaporeans with relevant skills. To help implement these changes in the industry, the government also aims to deepen ties with our industry associations.

Pursuing Operational Excellence

¹ Boeing market forecast 2017: APAC could account for 37% of aircraft deliveries by 2036.

7. To remain globally competitive, Singapore must focus on increasing productivity within the industry. To this end, the Government is encouraging companies to invest in new equipment and automation to build best-in-class facilities, as well as deepen capabilities to drive process improvement.

8. For instance, home-grown aerospace company, Singapore Aerospace Manufacturing (SAM), is investing in advanced automation equipment, as well as software and engineering capabilities to upgrade existing lines to manufacture nextgeneration aircraft components. It expects productivity gains of up to 30% through increased efficiency and reliability of its manufacturing processes. SAM is also grooming a full-time team to support and lead continuous improvement.

9. Companies are also exploring new technologies to enable them to make better, data-driven decisions. ST Aerospace has embarked on a digital and productivity transformation initiative known as Smart MRO. It leverages data analytics to optimise internal processes and bring new value to customers through solutions like customised predictive maintenance. ST Aerospace will also adopt solutions such as drones for aircraft inspection and additive manufacturing for spare parts, which have the potential to improve cost efficiency and turnaround time.

Driving Innovation in Emerging Technologies

10. The second thrust of our strategy to transform the industry focuses on building Singapore's innovation capabilities. Singapore continues to invest in its public research ecosystem. A*STAR will be supporting the innovation pillar in the Aerospace ITM. Over the last decade, A*STAR's Aerospace Consortium has brought together leading aerospace companies to collaborate in more than 120 aerospace research projects. The programme has helped Singapore build a foundation of aerospace-related R&D capabilities in areas such as advanced materials, non-destructive inspection techniques, process automation, avionics and wireless communications.

(Please refer to Annex B for more information on the A*STAR's Aerospace Consortium.)

11. Moving forward, EDB and A*STAR will encourage the development of industry-relevant technologies which can be brought to commercialisation in the coming years.

Possible focus areas include industrial internet-of-things (IIoT), additive manufacturing, data analytics for predictive maintenance and asset optimisation.

12. Robust and responsive regulatory support from the Government is key in enabling technology advancements. CAAS has been working closely with EDB on this front. CAAS has maintained a facilitative regime to nurture new industry segments whilst balancing the need to maintain safety standards. For example, CAAS and SPRING intend to set up an industry work group to develop technical standards for use of unmanned aerial systems (UAS) in Singapore, responding to the rapid developments in this new area.

Equipping Singaporeans with Relevant Skills

13. To equip Singaporeans with the necessary skills that will allow them to take on new job scopes and employment opportunities, the Skills Framework for Aerospace is also launched today. Jointly developed by SkillsFuture Singapore (SSG), Workforce Singapore (WSG) and EDB, with inputs from industry stakeholders, unions, and education and training institutions, the Skills Framework allows individuals to explore career growth opportunities along or across four different tracks within the sector, covering 86 job roles. These tracks include Aircraft Maintenance, Fleet Maintenance, Aircraft Engine/Component Maintenance, and Manufacturing. The Skills Framework also provides key information on the sector, including current and emerging skills and competencies, and the relevant training programmes for each job role. Examples of the emerging skills and competencies identified are Rapid Prototyping, Advanced Composite Failure Analysis, and Data Mining Techniques for Manufacturing Excellence. (Please refer to Annex C for more information on the Skills Framework for Aerospace)

14. As the industry transforms and adopts advanced manufacturing technologies, our Institutes of Higher Learning (IHLs), together with research institutes and private training providers such as A*STAR's Singapore Institute of Manufacturing Technology

(SIMTech) and TUM Asia, are working closely with the industry to curate and deliver bite-sized industry-relevant modules in emerging areas such as robotics, automation, data analytics and cyber security under the SkillsFuture Series. Temasek Polytechnic will also be rolling out two new SkillsFuture Earn and Learn Programmes (ELPs) in Robotics and Automation and IIoT, which are contextualised to the needs of the aerospace industry. (Please refer to Annex D for more information on ELPs)

15. WSG has also put in place programmes such as the Professional Conversion Programme (PCP), which aims to equip mid-career PMETs for new careers in growth industries. The four existing PCPs have since benefited more than 60 mid-career PMETs. Two new PCPs for Aerospace Officers and Aerospace Executives have been launched. (Please refer to Annex E for more information on PCPs.)

Deepening Ties with Industry Associations and Unions as Key Partners

16. Taking a broader industry perspective, the Government will partner with Trade Associations and Chambers (TACs) such as the Association of Aerospace Industries Singapore (AAIS) and Singapore Institute of Aerospace Engineers (SIAE), as well as unions, including those from the NTUC Aerospace and Aviation Cluster, to transform the industry.

17. “The ITM is dynamic and respond to developments within the industry. Continuous process of change and constant tripartite engagement is essential to ensure its success. The Cluster stands ready to work with employers to reposition themselves, transform their jobs, and retrain workers to be able to take on new roles and capture new opportunities,” said Ong Hwee Liang, Chairman of NTUC Aerospace and Aviation Cluster.

18. JTC has signed a Memorandum of Understanding (MOU) with AAIS, aerospace companies, as well as the polytechnics and Institute of Technical Education (ITE) to collaborate on a new series of aerospace student outreach initiatives that aims to develop a pipeline of future-ready talent. The initiatives are expected to benefit some 1,500 students from the aerospace engineering courses annually. The first

collaboration will be the inaugural Aerospace Day @ SAP that will be held in April this year. This collaboration will benefit final-year students from polytechnics and ITE, providing them with the opportunity to visit the aerospace companies in SAP, exposing them to the working environment, and the career opportunities available in the industry. -End-

About the Singapore Economic Development Board (EDB)

EDB is the lead government agency for planning and executing strategies to enhance Singapore's position as a global business centre. EDB dreams, designs and delivers solutions that create value for investors and companies in Singapore. Our mission is to create for Singapore, sustainable economic growth with vibrant business and good job opportunities.

For more information on EDB, please visit www.sedb.com

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Annex A

CIVIL AVIATION AUTHORITY OF SINGAPORE AGREEMENTS WITH FAA AND EASA

On the regulatory front, the Civil Aviation Authority of Singapore (CAAS) has concluded an aviation maintenance agreement with the US Federal Aviation Administration (FAA). The first of its kind established by FAA in the Asia Pacific, this agreement opens the way for the mutual recognition of procedures for the approval and monitoring of aircraft maintenance organisations.

Similarly, CAAS has also concluded a mutual recognition agreement with the European Aviation Safety Agency (EASA) on airworthiness certification of aircraft modifications and repairs, and aeronautical products. Both agreements are significant steps towards reducing regulatory burdens and compliance costs for the aviation industry on both sides.

For more information, please visit <https://www.caas.gov.sg>

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Annex B

A*STAR AEROSPACE CONSORTIUM

Established in 2007, the A*STAR Aerospace Consortium counts amongst its members many leading global airframe and engine manufacturers, component and specialist materials companies, as well as local enterprises. The consortium undertakes precompetitive research to find solutions to address future challenges in the aerospace industry.

For more information, please visit:

<https://www.a-star.edu.sg/aerospace/Consortium.aspx>

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**FACTSHEET ON SKILLS FRAMEWORK FOR AEROSPACE BY
SKILLSFUTURE SINGAPORE**

About Skills Framework

The Skills Framework is an integral component of the Industry Transformation Maps and it is co-created for the Singapore workforce by employers, industry associations, unions, education and training institutions and the government. The Skills Framework provides key information about the sector, career pathways, occupations and job roles, as well as existing and emerging skills required for the occupations and job roles.

2 The Skills Framework aims to create a common skills language for individuals, employers, and education and training providers. It will facilitate skills development and recognition for the Singapore workforce and supports their career development in terms of employment and employability. It will also support the development of industry-relevant training programmes, and enhance business competitiveness.

About Skills Framework for Aerospace

3 The Skills Framework for Aerospace aims to enable skills mastery in the Aerospace sector. Jointly developed by SkillsFuture Singapore, Workforce Singapore (WSG), and the Singapore Economic Development Board (EDB), together with employers, industry associations, education and training providers and unions, the Skills Framework for Aerospace has identified key skills and competencies for the sector, including emerging skills such as Rapid Prototyping, Advanced Composite Failure Analysis, and Data Mining Techniques for Manufacturing Excellence.

Who is it for?

- 4 The Skills Framework for Aerospace can be used by the following groups:
- Individuals who wish to join or progress within the Aerospace sector will be able to assess their career interest, identify relevant training programmes to upgrade their skills, and prepare for their desired jobs;

- Employers will be able to recognise these skills and invest in training their employees for career development and skills upgrading;
- Education and training providers can gain insights on sector trends, existing and emerging skills that are in demand, and design programmes to address the sector needs accordingly; and
- Government, unions and professional bodies will be able to analyse skills gaps and design appropriate SkillsFuture initiatives to upgrade the manpower capability and professionalise the sector.

Key Components of the Skills Framework

5 The Skills Framework for Aerospace contains information on the sector, career pathways, occupations and job roles, skills and competencies, and training programmes*. The key components include:

- Sector information – provides information on key statistics, trends and workforce profiles in the Aerospace sector
- Career pathways – depict the pathways for vertical and lateral progression for advancement and growth. Four tracks have been identified which include Aircraft Maintenance, Fleet Management, Aircraft Engine/Component Maintenance and Manufacturing covering 86 job roles.
- Occupations and job roles – covers a total of 264 existing and emerging skills and competencies, and their respective descriptions. Some of the emerging skills identified include Rapid Prototyping, Advanced Composite Failure Analysis, Safety and Risk Management in Engineering and Data Mining Techniques for Manufacturing Excellence.

- Training programmes* for skills upgrading and mastery – provides information on training programmes which will help aspiring individuals and in-service employees acquire skills required for various jobs.

**The training programmes for the Skills Framework for Aerospace are available at www.skillsfuture.sg/skills-framework/aero*

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Annex D

**FACTSHEET ON SKILLSFUTURE EARN AND LEARN PROGRAMME –
SPECIALIST DIPLOMA IN ROBOTICS AND AUTOMATION, AND
SKILLSFUTURE EARN AND LEARN PROGRAMME – SPECIALIST DIPLOMA
IN INDUSTRIAL INTERNET OF THINGS**

About SkillsFuture Earn and Learn Programme

The SkillsFuture Earn and Learn Programme (ELP) is a work-learn programme that gives fresh graduates¹ from polytechnics and the Institute of Technical Education (ITE) a head-start in careers related to their discipline of study. It provides them with more opportunities, after graduation, to build on the skills and knowledge they acquired in school, and better supports their transition into the workforce.

About SkillsFuture Earn and Learn Programme – Specialist Diploma in Robotics and Automation

2 The ELP – Specialist Diploma in Robotics and Automation is a 12-month worklearn programme delivered and managed by Temasek Polytechnic. The programme aims to deepen and equip fresh polytechnic graduates¹ with the relevant skills to undertake the installation and maintenance of robotic and automation equipment and the application of robot for collaboration in the workplace.

Who is it for?

- Fresh polytechnic graduates¹ looking for skills deepening through structured workplace learning, mentorship and facilitated learning to get a head-start in their career and meaningful career advancement upon programme completion
- Companies seeking to attract and hire fresh polytechnic graduates¹ as an Associate Engineer in Robotics and Automation through a 12-month work-learn programme

How does it work?

3 Suitable candidates will be matched with a job related to their field of study and participating employers can recruit local fresh talent and benefit from structured career development through the company's talent development plan.

Benefits

- For individuals

- Individuals can acquire relevant work experience and skills valued by the industry and attain industry-recognised qualification/certification²
- Receive a competitive starting salary and full-time employment with participating companies
- Eligible individuals can receive a sign-on incentive of \$5,000³

- For employers

- Companies will be able to recruit, groom and retain suitable young talents with the relevant skills and aptitude to be developed as future Aerospace leaders to drive advanced manufacturing in the company
- Receive a grant of up to \$15,000⁴ per individual³ places in ELP to defray the costs of developing and providing structured On-the-Job training

About SkillsFuture Earn and Learn Programme – Specialist Diploma in IIoT

4 The ELP – Specialist Diploma in IIoT is a 12-month work-learn programme delivered and managed by Temasek Polytechnic. The programme aims to deepen and equip fresh polytechnic graduates¹ with the relevant skills in IIoT, engineering analytics, machine learning and smart sensors and devices.

Who is it for?

- Fresh polytechnic graduates¹ looking for skills deepening through structured workplace learning, mentorship and facilitated learning to get head-start in their career and meaningful career advancement upon programme completion.
- Companies seeking to attract and hire fresh polytechnic graduates¹ as an Associate Engineer in IIoT through a 12-month work-learn programme

How does it work?

5 Suitable candidates will be matched with a job related to their field of study and participating employers can recruit local fresh talent and benefit from structured career development through the company's talent development plan.

Benefits

- For individuals

¹ Within three years of graduation or Operationally Ready Date for National Servicemen

- Individuals can acquire relevant work experience and skills valued by the industry and attain industry-recognised qualification/certification¹
- Receive a competitive starting salary and full-time employment with participating companies
- Eligible individuals can receive a sign-on incentive of \$5,000²

- For Employers

- Companies will be able to recruit, groom and retain suitable young talents with the relevant skills and aptitude to be developed as future Aerospace leaders to drive advanced manufacturing in the company
- Receive a grant of up to \$15,000³ per individual³ places in ELP to defray the costs of developing and providing structured On-the-Job training

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¹ The industry-recognised qualifications/certificates will vary from sector to sector, and from job to job. They may include Singapore Workforce Skills Qualifications (WSQ) qualifications, or qualifications issued by the polytechnics such as Advanced/Specialist Diploma

² For fresh graduates who are Singapore Citizens and within three years of graduation or Operationally Ready Date for National Servicemen only

³ Terms and Conditions apply

Annex E

FACTSHEET FOR THE AEROSPACE PROFESSIONAL CONVERSION PROGRAMMES (AEROSPACE PCPs)

1. The Aerospace PCPs were developed as part of the Adapt and Grow initiative to provide greater support to mid-career PMETs.
2. With the launch of two new PCPs for Aerospace Officers and Aerospace Executives, there are now six PCPs administered by SIA Engineering Company (SIAEC) and Temasek Polytechnic (TP).
 - PCP for Aerospace Officer – *new*
 - PCP for Aerospace Executive – *new*
 - PCP for Aircraft Maintenance Technician (Avionics)
 - PCP for Aircraft (Mechanical)
 - PCP for Engine Build Technician
 - PCP for Engine Repair and Overhaul Technician
3. Trainees will be employed and subsequently undergo training, comprising Workforce Skills Qualifications (WSQ) certification programmes, facilitated classroom sessions and structured On-the-Job-Training (OJT). The programme durations range from 9 to 12 months.
4. The PCPs are catered to mid-career entrants who are keen to join the aerospace sector, and allows candidates to be employed and, at the same time, acquire new skills to perform their role in the highly specialised sector.
5. PMETs who have graduated or completed National Service for more than 2 years can apply for the Aerospace PCPs. The PCPs will operate on a Place-and-Train mode where participating companies will employ the trainees before they embark on the training programme (see Annex D1 for PCP archetypes)
6. Upon successful completion of programme, trainees will be awarded the Singapore WSQ certifications¹ issued by SSG.

Companies on board the programme

¹ Applicable to PCPs for Aircraft Maintenance (Avionics/Maintenance), Engine Build, Engine Repair and Overhaul Technicians

7. Six companies have come on board the Aerospace PCPs as follows:

- Avitron Pte Ltd
- GE Aviation
- Rolls Royce – Seletar Assembly and Test Unit
- SIA Engineering Company Ltd
- Singapore Aerospace Manufacturing Pte Ltd
- Singapore JAMCO Services Pte Ltd

Programme Support for Companies

8. The PCPs aim to help lower the companies' cost of hiring PMETs by

- Providing salary support at 70% of participant's salary capped at \$4,000 per month for the duration of training period; or
- Enhanced salary support of 90% of participant's salary capped at \$6,000 per month for Singapore Citizens (SC) who have been unemployed for more than 6 months or mature SC PMETs who are aged 40 or above.

9. The PCPs will help companies lower programme fees incurred by providing course fee support of up to 90%.

Eligibility Criteria

10. Participants must fulfil the following criteria:

- The participant must be a Singapore Citizen or Singapore Permanent Resident;
- Participant must be a newly hired PMET and nominated by an eligible participating company for the PCP; and
- Participant must not be in a similar job role prior to joining PCP and graduated or completed National Service for at least 2 years.

11. Participating companies must fulfil the following criteria:

- The participating company must be registered or incorporated in Singapore;
- The participating company must issue a valid employment contract; and
- The participating company must be able to provide structured OJT training for the participant.

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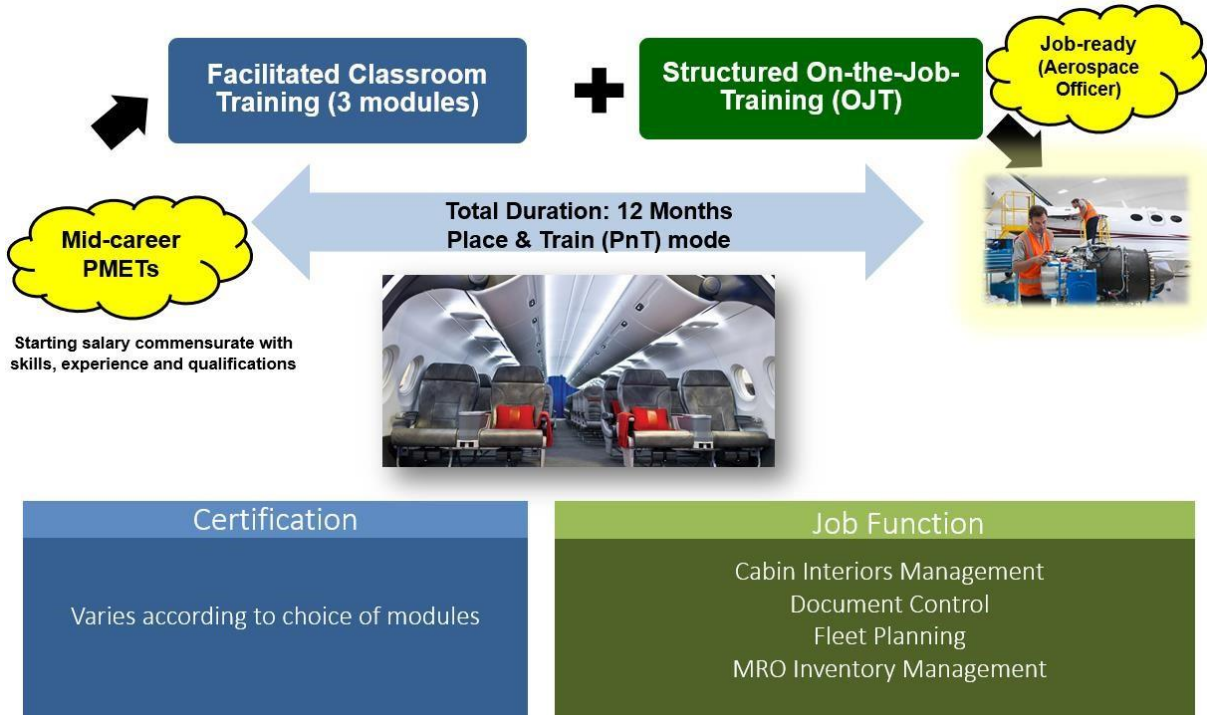
Workforce Singapore

Tel: 6512 1203

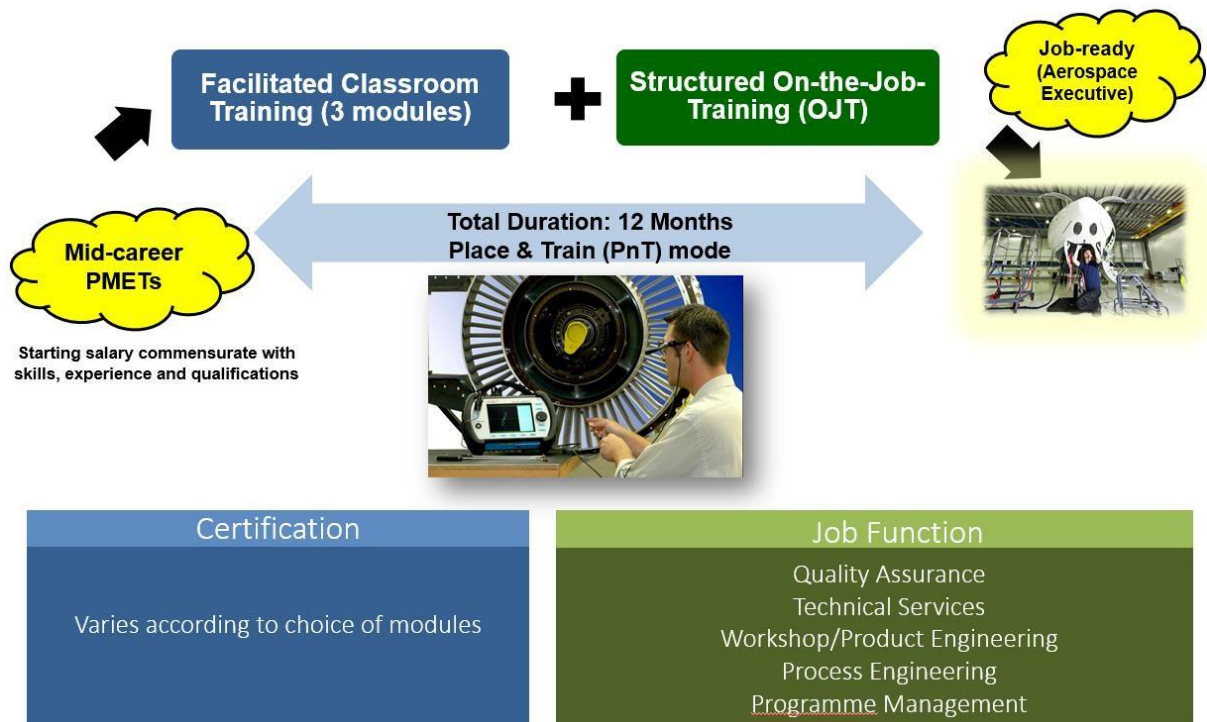
Email: chung_wen_hua@wsg.gov.sg

ARCHETYPES FOR AEROSPACE PCPS

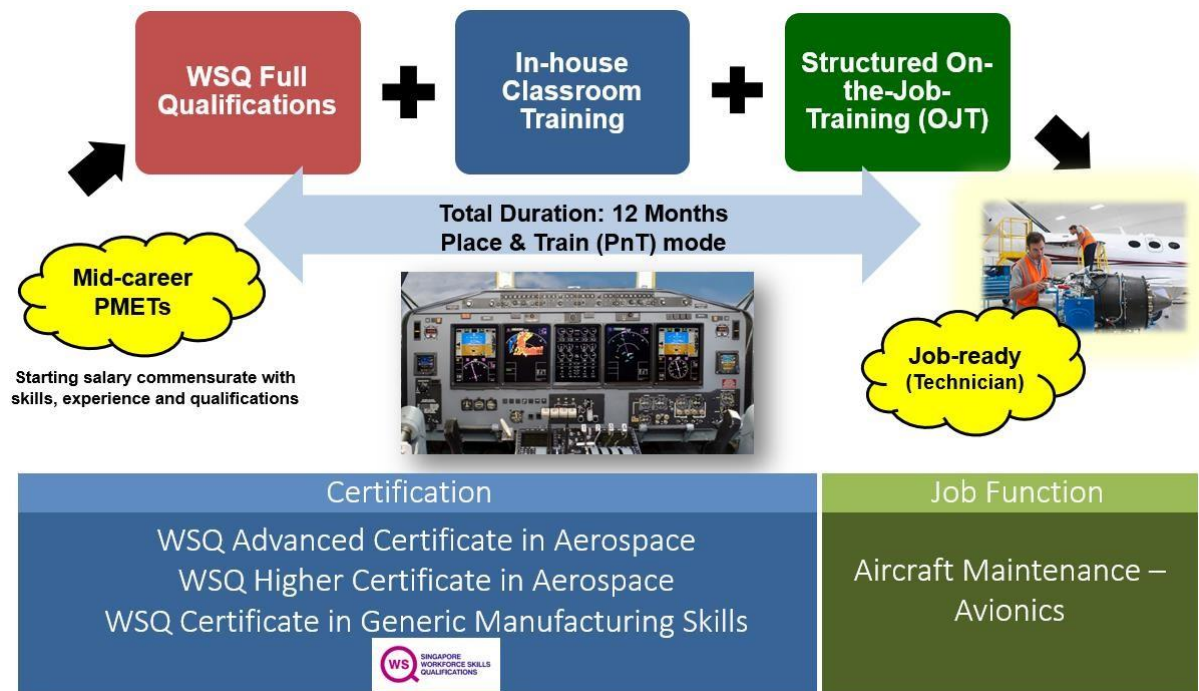
1. Archetype for Aerospace Officer (NEW)



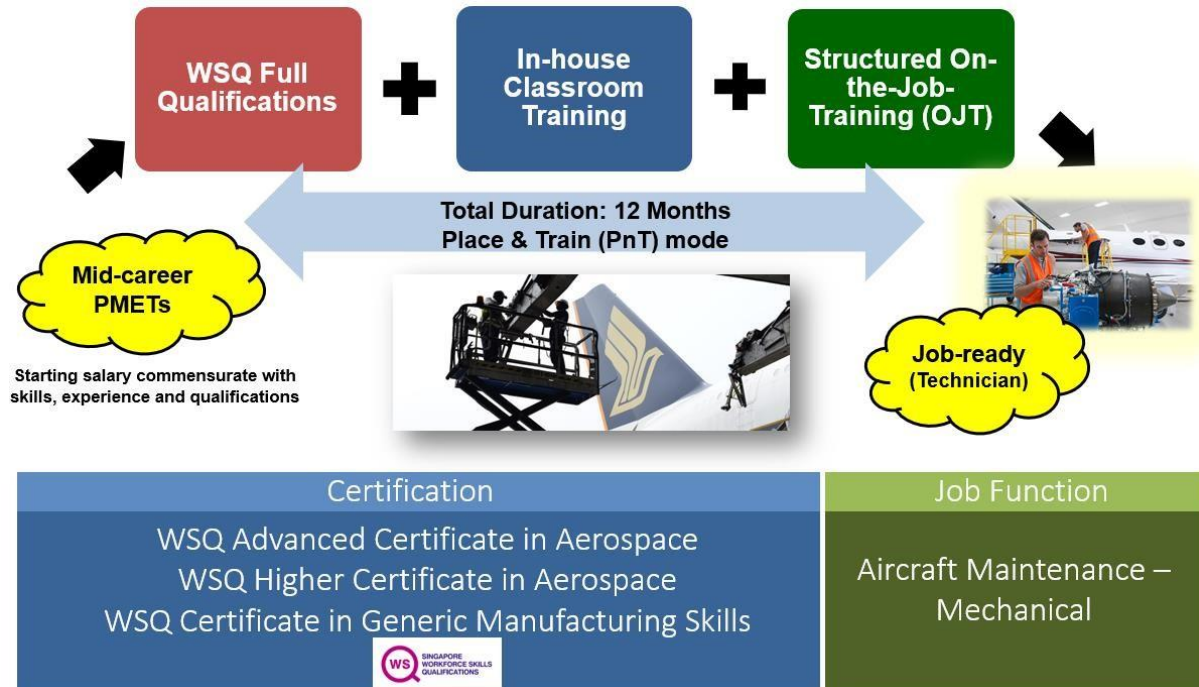
2. Archetype for Aerospace Executive (NEW)



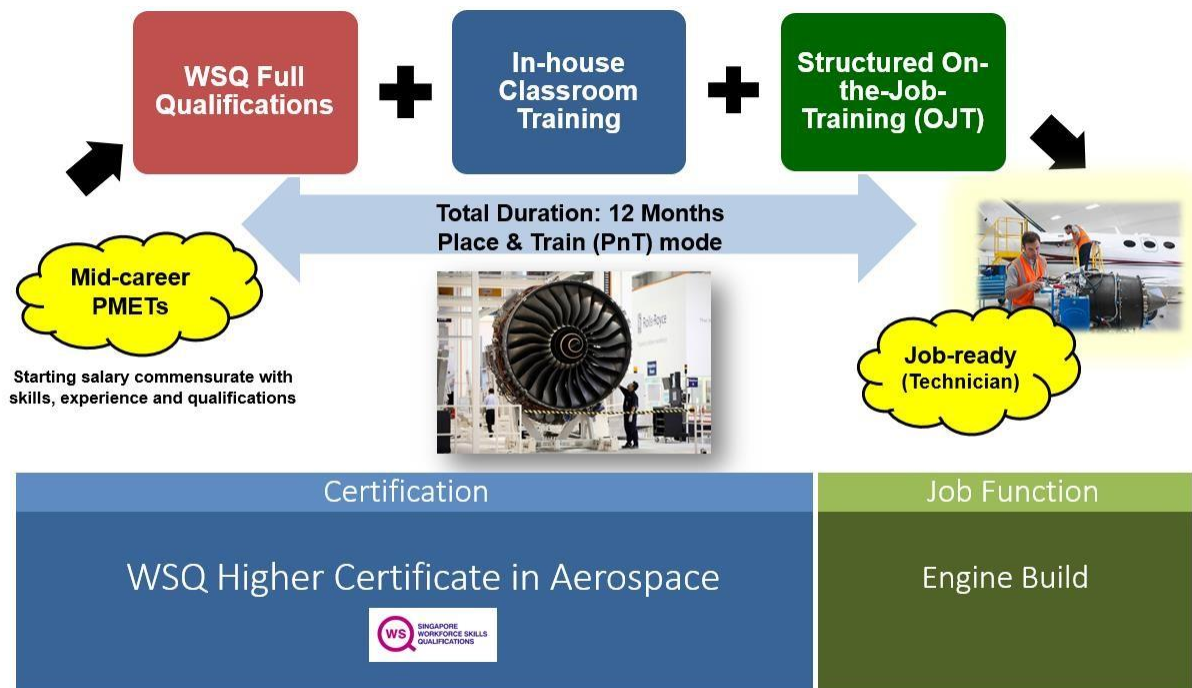
3. Archetype for Aircraft Maintenance (Avionics) Technician



4. Archetype for Aircraft Maintenance (Mechanical) Technician



5. Archetype for Engine Build Technician



6. Archetype for Engine Repair and Overhaul Technician

