



# OCCUPATIONAL FRAMEWORK AEROSPACE INDUSTRY



**JABATAN PEMBANGUNAN KEMAHIRAN  
KEMENTERIAN SUMBER MANUSIA**  
Department of Skills Development  
Ministry of Human Resources, Malaysia



**NATIONAL AEROSPACE INDUSTRY  
COORDINATING OFFICE (NAICO)**  
Ministry of International Trade and Industry,  
Malaysia

First Printing 2017  
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Ministry of Human Resources, Malaysia 2017

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Published in Malaysia by  
Department of Skills Development (DSD)  
Ministry of Human Resource  
Level 7-8, Block D4, Complex D  
Federal Government Administrative Centre  
62530 Putrajaya, Malaysia  
<http://www.dsd.gov.my>

Printed by  
Percetakan Jazamas  
No 2A, 6 & 8, Jalan MJ 49, Taman Merdeka Jaya,  
Batu Berendam, 75350, Melaka.  
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Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Occupational Framework  
Aerospace Industry  
ISBN 978-967-0572-76-5



## ABSTRACT

The Department of Skills Development (*Jabatan Pembangunan Kemahiran (JPK)*) under the Ministry of Human Resources, in collaboration with the National Aerospace Industry Coordinating Office (NAICO) under the Ministry of International Trade and Industry, have taken the initiative to develop the Occupational Framework (OF) for the Aerospace Industry. As an Industry Lead Body (ILB) appointed by JPK, NAICO is responsible for guiding the overall development of the Aerospace Industry human capital in regards to skills training under JPK. An Occupational Framework (OF) is the outcome of the analysis conducted in identifying the work scope of the occupational areas in terms of competencies. It is used to analyse skilled human resource competency requirement for the industry. The development of the Occupational Structure is a preliminary process in developing relevant National Occupational Skills Standard (NOSS). The NOSS in turn will be developed to be used as the basis to conduct skills training and certification of competent personnel. This document is divided into several chapters; the first two chapters include standard definitions of terminology used in the skills training system and documentation, industry overview highlighting the definition and scope of the industry, the current Aerospace Industry and its skilled worker requirements, Government bodies and development plans supporting the growth of the industry. The third chapter will explain the methodology used in Occupational Framework development such as qualitative analysis through brainstorming discussion sessions and industry surveys. Chapter 4 will discuss the findings of the focus group discussions and survey conducted that are translated into the Occupational Structure, Occupational Description and Skills in Demand. Ultimately Chapter 5 recommends the development of the National Occupational Skills Standard (NOSS) for certain job areas in demand. The NOSS will serve as a reference of skills standards for certification and also as a guide for skills training curriculum development to be in line with industry requirements.



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## LIST OF ABBREVIATIONS

<b>CBT</b>	Competency Based Training
<b>DACUM</b>	Development of A Curriculum
<b>ETP</b>	Economic Transformation Programme
<b>GNI</b>	Gross National Income
<b>ILB</b>	Industry Lead Body
<b>JPK</b>	Jabatan Pembangunan Kemahiran (Department of Skills Development)
<b>MOSQF</b>	Malaysian Occupational Skills Qualification Framework
<b>MQA</b>	Malaysian Qualification Agency
<b>MQF</b>	Malaysian Qualifications Framework
<b>MSC</b>	Malaysian Skills Certificate
<b>NCS</b>	National Competency Standards
<b>NKEA</b>	National Key Economic Areas
<b>NOSS</b>	National Occupational Skills Standard
<b>OF</b>	Occupational Framework
<b>OD</b>	Occupational Description
<b>OS</b>	Occupational Structure



# CHAPTER 1: INTRODUCTION

## 1.1 CHAPTER INTRODUCTION

This chapter will explain the objectives, scope and justification for the development of the Occupational Framework for the Aerospace Industry. The concept of the Occupational Framework and its function in skills training and curriculum development is also elaborated in this chapter.

There have been several National Occupational Skills Standard (NOSS) documents developed specifically for the Aerospace Industry. These NOSS are listed in Chapter 2 of this report. However, a complete analysis on the Occupational Structure of the Aerospace Industry has not been undertaken before this by *Jabatan Pembangunan Kemahiran (JPK)*, the Department of Skills Development. Therefore, in order to identify the overall structure and the available career paths in the industry, the Occupational Framework must be identified with regards to the Aerospace Industry.

Below are descriptions of important elements of the research.

### **i. National Skills Development Act, 2006 (Act 652)**

The National Skills Development Act, 2006 (Act 652) came into effect on 1st September 2006 after it was officially gazetted on 29th June 2006, with the mandate of promoting, through skills training, the development and improvement of a person's abilities, which are needed for vocation, and to provide for other matters connected therewith. The Act 652 is significant because for the first time in the history of skills training in Malaysia, a national legislation has been enacted solely and exclusively for skills training and development. In addition, the meaning and scope of skills training have been clarified and given a statutory interpretation that can be used to distinguish it from other components of the country's national education and training system. The Act 652 also provides for the implementation of a Malaysian Skills Certification System, leading to the award of five (5) levels of national skills qualification, namely Malaysian Skills Certificate Level 1, 2 and 3; Malaysian Skills Diploma; and Malaysian Skills Advanced Diploma.

### **ii. Malaysia Qualification Framework (MQF)**

The Malaysia Qualification Framework refers to the policy framework that satisfies both the national and international recognised qualifications. It consists of titles and guidelines, together with principles and protocols covering articulation and issuance of qualifications and statements of attainment. Elements of the qualifications framework indicate the achievement for each qualification title. It will also provide progression routes for all the graduates in the respective occupational fields.



The MQF has eight levels of qualifications in three sectors and it is supported by lifelong education pathways as shown in Figure 1.1. JPK governs the skills sector, in which there are five (5) levels of skills qualification. The definition for each level of skills qualification is specified in the Malaysian Occupational Skills Qualification Framework (MOSQF).

MQF LEVELS	SECTORS			Lifelong Learning
	Skills	Vocational and Technical	Higher Education	
8			Doctoral Degree	Accreditation of Prior Experience Learning (APEL)
7			Masters Degree	
6			Bachelor Degree	
5	Malaysian Advanced Skills Diploma	Advance Diploma	Advance Diploma	
4	Malaysian Skills Diploma	Diploma	Diploma	
3	Malaysian Skills Certificate 3	Vocational and Technical Certificate	Certificate	
2	Malaysian Skills Certificate 2			
1	Malaysian Skills Certificate 1			

**Figure 1.1: MQF Chart**  
(Source: Jabatan Pembangunan Kemahiran (JPK))

### iii. National Occupational Skills Standard (NOSS)

The National Occupational Skills Standard (NOSS) is defined as a specification of the competencies expected of a skilled worker who is gainfully employed in Malaysia for an occupational area, level and pathway to achieve the competencies and is gazetted in Part IV of the National Skills Development Act, 2006 (Act 652). NOSS is developed by industry experts based on the needs of the industry and is utilised as the main tool in the implementation of Malaysian Skills Certification System in which the performance of existing industry workers and trainees are assessed based on the NOSS to award the Malaysian Skills Certificate.

### iv. Competency Based Training (CBT)

Competency Based Training (CBT) is an approach to vocational training which emphasises on what a person can do at his work place as a result of the education and training obtained. CBT is based on performance standards which are set by the industry with main focus on measuring the performance while taking into account knowledge and attitude rather than the duration taken to complete the course. CBT is a learner-centric, outcome-based approach to training which allows each individual to develop skills at their own pace for a similar outcome. Thus, training practices can be customised for each individual to achieve a similar outcome. CBT concept is the basis of Malaysian Skills Certification system which is coordinated by JPK.

### v. Occupational Framework (OF)



The Occupational Framework (OF) is the outcome of the occupational analysis process to identify the occupational structure of an industry. The OF which was previously known as Occupational Analysis (OA), consists of the Occupational Structure (OS), Occupational Description (OD) and Skills in Demand.

The development of the OF is a preliminary process in developing relevant NOSS. Once developed, the NOSS can be used as the basis to conduct skills training and skills certification of competent personnel.

## **1.2 OBJECTIVES OF STUDY**

The objectives of the study are as below:

- To produce OS from data analysis, interviews, site visits and focus group;
- To determine OD of job titles in the OS; and
- To investigate the skills in demand in the industry.

## **1.3 SCOPE OF STUDY**

The scope of work for the study to develop the occupational framework is as listed below:

- To conduct literature review on the current industry;
- To consult with industry representatives to obtain expert input from industry;
- To develop, disseminate and analyse survey data from industries via industry representatives; and
- To perform focus group discussion with the industry representatives, interviews, site visits and/or any other methods in order to achieve the study outcome.

## **1.4 BACKGROUND OF THE AEROSPACE INDUSTRY IN MALAYSIA**

In order to further understand the scope of coverage under the Aerospace Industry, it is important to firstly understand the definition of the Aerospace Industry.

The Aerospace Industry defined in the Malaysian Aerospace Industry Blueprint (MAIB) 2030 is as follows; "Covers the industrial activities that relates to the design, development, manufacturing, construction, maintenance & disposal of aircraft, spacecraft, missiles, and rockets. It includes the enablers to the above activities namely regulatory of civil and military aviation, talent development particularly aerospace education & training, as well as the supporting infrastructures such as airports, Fix Based Operators (FBO) and technology parks."

The definition of the Aerospace Industry purposely excludes the "operation" aspect of aircraft, spacecraft, and missile & rockets so that the scope of the Aerospace Industry is confined only to those that support the aviation sector namely Commercial Aviation, General Aviation (GA) and Military Aviation. This exclusion is in line with the Government decision in 2012 to establish the National Aviation Council to oversee the aviation sector and coordinate all policies related to the aviation industry in the country. The breakdown of the five (5) focus areas or subsectors of the Aerospace Industry covered by MAIB 2030 cover MRO, Aero manufacturing, Systems Integration, Engineering & Design Services and Education & Training."



The definition of the Aerospace Industry as defined by the Ministry of Trade and Industry (MITI) with the latter part similar to the definition in the MAIB 2030 is as follows;

"The word Aerospace is a combination between the words air and space which means the human effort in science, engineering and business to fly in the air and surrounding space. Aerospace Industry covers the industrial activities that relates to design, development, manufacturing, construction, maintenance & disposal of aircraft, spacecraft, missiles and rockets. The "operation" aspect was excluded so that the scope of Aerospace Industry is confined only to those that support the aviation sector."

As there is currently an existing Occupational Framework for the Aviation Industry, the definition of the Aerospace Industry as compared to the Aviation industry should also be clearly understood. The aviation and aerospace industries cover different airspace. The aviation industry deals with all-things aircraft-related within the earth's atmosphere. These dealings include the design, manufacture and operation of many types of aircraft within this airspace. While the Aerospace Industry also designs and manufactures various forms of aircraft, the industry, as a whole, extends beyond operations within the earth's atmosphere and conducts aircraft operations in space. There is different demand for goods and services in the aviation and aerospace industries. For example, in the aviation industry there is demand from travellers or shipping services to access aircraft and pilots that can transport people and goods internationally. The Aerospace Industry, on the other hand, has different demands on it from a different type of consumer base that includes more military and industrial clientele with an eye toward space travel or space communications. (Crystal Voght, 2008)<sup>1</sup>.

Malaysia's Aerospace Industry is seen by the government as a strategic industry that has a wide potential in the country's industrialisation and technological development programmes. A number of initiatives have been developed by the government to fulfil the vision of the Aerospace Industry's Blueprint which is *"to achieve no. 1 aerospace nation in South East Asia (SEA) and as an integral part of the global market by 2030"*.

Among the efforts undertaken by the government under the Economic Transformation Programme (ETP) are the 4 key initiatives, which are:

- a) EPP1: Growing Aviation Maintenance, Repair and Overhaul Services
- b) EPP5: Nurturing Pure-Play Engineering Services
- c) EPP7: Making Malaysia the Hub for Aerospace OEM in South East Asia
- d) EPP8: Developing SMEs in the Global Aerospace Manufacturing Industry

These implementations are the key effort to promote the aerospace activities and to stimulate business services in Malaysia. Following the key initiatives, two aerospace development programmes under RMK11 are the Aerospace Industry Development Program and the Aerospace Composites Research which are done to unlock the potential of the productivity and accelerate the sectoral growth of the Aerospace Industry.

Under the MAIB 2030, 7 strategies have been defined to contribute to the advancement and development of the industry;

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<sup>1</sup> Crystal Voght. (2008) Chron. The Difference Between The Aviation And The Industry Aerospace Industry. <http://smallbusiness.chron.com/difference-between-aviation-industry-aerospace-industry-26208.html>



- Apply policies that will impact the future landscape of the industry;
- Enhance the effectiveness of institutions that have direct influence on the growth of the industry;
- Harmonise civil and military regulations and promote green practices;
- Invest in R&T to develop new capabilities and enhance industry competitiveness;
- Promote aerospace investments through incentives and matching funding;
- Attract and prepare the workforce of tomorrow for Malaysia and the region; and
- Capture new market and strengthen local supply chain.

Malaysia's Aerospace Industry focuses on the following five main areas: Maintenance, Repair and Overhaul (MRO), Aero Manufacturing, Engineering and Design, System Integration, Education and Training (E&T) and supported by Research & Technology activity. Currently, there are about 64 MRO companies operating in Malaysia. In 2016, Aero Manufacturing that covers engineering & design; aero-structure (composites and metallic); avionics; engines; and airframe equipment they have taken over as the main contributor to the Aerospace Industry revenue accounting for 50%. This is followed by MRO which makes up 45% of the industry revenue. While for systems integration which covers the development and testing of a whole host of systems, such as radio navigation, flight management and monitoring applications, currently there are about 8 major systems integration companies operating in Malaysia. These companies play a vital role in modernisation, upgrading and sustainment, and also for maintenance and logistics support for a wide variety of aircraft, parts and components. In terms of Education & Training, Malaysia has a total of 56 education and training providers on aerospace related programmes which consist of: 27 higher learning institutions; 15 technical training academies; and 14 DCA Part-147 approved training organisations (ATO). This area is particularly important in ensuring that the demand and supply for licensed aircraft engineers and technicians are of the same capacity.

Aircraft production business is expanding worldwide. Airbus is forecasting that the new aircraft delivery are expected to reach 34,900 aircraft valued at USD5.3 trillion (excluding regional jets) by 2036.<sup>2</sup> Meanwhile, Boeing also forecasted the 41,030 new aircraft valued at USD6 trillion that are needed by 2036.<sup>3</sup> This global aerospace outlook has given pressures to global aerospace suppliers to cope with the growing demands of the OEMs. These include efficient production and delivery systems which require advanced technology adaptation and innovative manufacturing processes.

The total revenue from Malaysia's Aerospace Industry has grown from RM0.9 billion in 1998 to RM12.7 billion in 2016.<sup>4</sup> The industry has provided more than 21,000 job opportunities with a total number of 200 plus companies in operation. Single-aisle aircrafts continue to be the most popular aircraft types based on increasing regional airline business. Currently, Malaysia is the single source of specific A320 parts (i.e. spoiler) to Airbus. By the year 2030, the industry is projected to contribute a revenue of the following; Aero Manufacturing (RM21.2 billion); MRO (RM20.4 billion); and Engineering & Design (RM13.6 billion).

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<sup>2</sup> Airbus Global Market Forecast 2017

<sup>3</sup> Boeing Current Market Outlook 2017-2036

<sup>4</sup> National Aerospace Industry Coordinating Office (NAICO)



## 1.5 CHAPTER CONCLUSION

With the Occupational Framework (OF) clearly defined, the industry players and agencies will be able to identify job areas and sub areas that will require more intensive efforts in human capital development. Although there have been past efforts in National Standards Development for the Sector, the need for a more comprehensive and holistic Occupational Framework is deemed necessary to determine the overall composition of areas and sub-areas that may have not yet been focused on. The Occupational Structure, Occupational Descriptions and Skills In Demand, which will be the outcome of this analysis shall be utilised as a “blueprint” or “framework” of the manpower planning for Aerospace sub-sectors such as Maintenance, Repair and Overhaul (MRO), Aero Manufacturing, System Integration, Education and Training (E&T) in Malaysia.



## CHAPTER 2: LITERATURE REVIEW

### 2.1 CHAPTER INTRODUCTION

This chapter provides a brief overview of the Aerospace Industry in Malaysia, its regulatory framework, its existing landscape, the key government initiatives and policies for the industry and industry intelligence.

Findings in this chapter were obtained primarily through literature review and subsequently confirmed by the Subject Matter Experts.

### 2.2 KEY STAKEHOLDERS

A stakeholder is defined as a person, group or organisation that has an interest or concern in an organisation. Stakeholders can affect or be affected by the organisation's actions, objectives and policies. For the purpose of this occupational framework, the scope of the stakeholders is confined within the Aerospace Industry. This literature review focuses more on the government agencies, regulatory bodies and industry association.

#### 2.2.1 REGULATORY BODIES, RELEVANT GOVERNMENT AGENCIES AND INDUSTRY ASSOCIATION

The regulatory bodies and relevant government agencies included in this section are involved directly with the development of the Aerospace Industry. The regulatory bodies relevant to the Aerospace Industry are the Department of Civil Aviation and National Space Agency (ANGKASA MALAYSIA).

The main stakeholders of the Aerospace Industry in Malaysia are listed below:

- 1) Malaysian Aerospace Council (MAC)
- 2) Ministry of International Trade and Industry (MITI)
- 3) National Aerospace Industry Coordinating Office (NAICO)
- 4) Ministry of Finance (MOF)
- 5) Economic Planning Unit (EPU)
- 6) Ministry of Transport (MOT)
- 7) Ministry of Defence (MINDEF)
- 8) Ministry of Science and Technology (MOSTI)
- 9) Ministry of Higher Education (MOHE)
- 10) Department of Civil Aviation Malaysia (DCA)
- 11) National Space Agency (ANGKASA)
- 12) Directorate General Technical Airworthiness (DGTA)
- 13) Malaysian Investment Development Authority (MIDA)
- 14) Malaysia External Trade Development Corporation (MATRADE)
- 15) SME Corporation Malaysia (SME Corp. Malaysia)
- 16) Majlis Amanah Rakyat (MARA)
- 17) Malaysia Aerospace Industry Association (MAIA)





The governance framework of the supporting agencies can be seen as shown below.

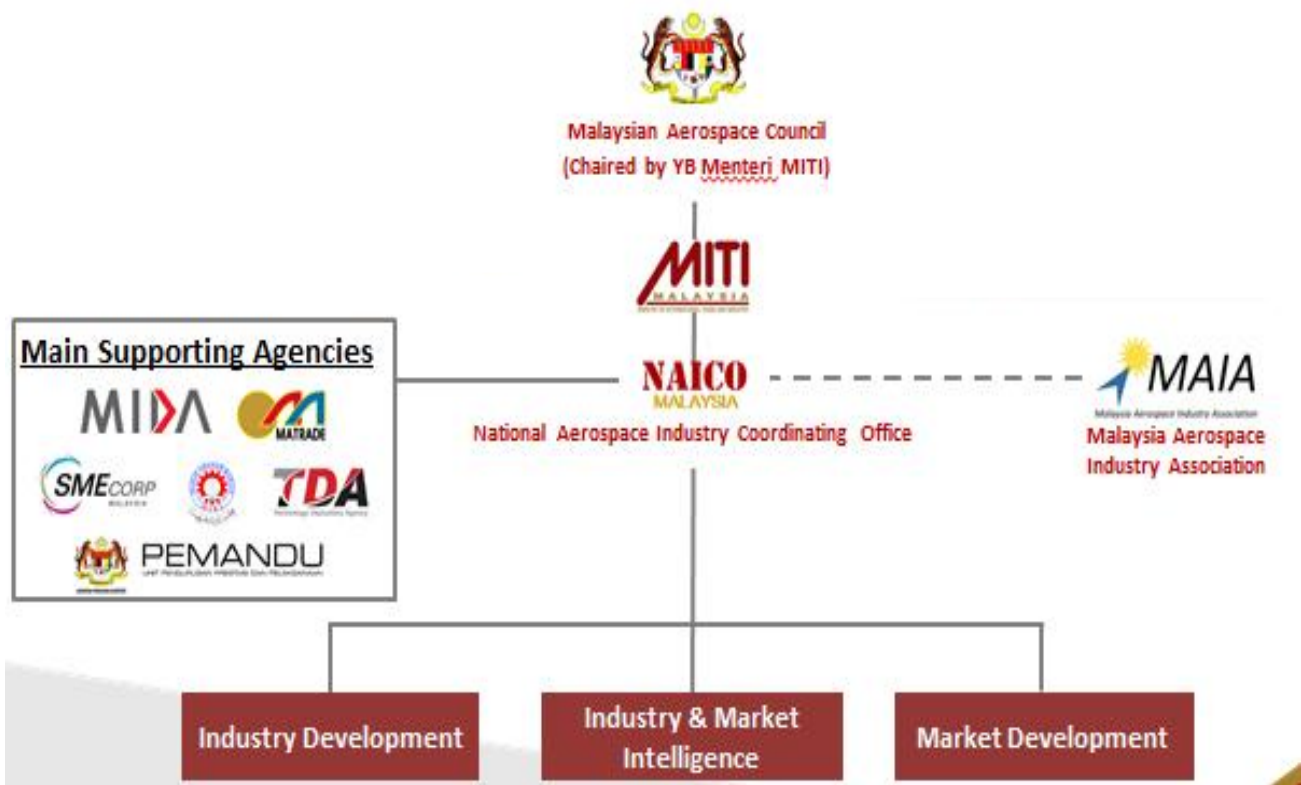


Figure 2.1: Aerospace Industry Governance Framework  
(Source: NAICO)

Operating at the highest level is the Malaysian Aerospace Council (MAC) which currently is chaired by the Minister of MITI. MAC's objective is to provide overall guidance and direction in the development of the Aerospace Industry in Malaysia. Its membership consists of senior Government officials from relevant Ministries and Agencies and industry representatives.

National Aerospace Industry Coordinating Office (NAICO) was established in August 2015 by the Ministry of International Trade and Industry (MITI) to lead the Malaysian Aerospace Industry Blueprint 2030, to ensure continued growth of the Aerospace Industry. NAICO serves as the focal point in linking the Aerospace Industry players, relevant Government ministries and agencies and academia to collectively work together in strengthening the capability and capacity of Malaysia's Aerospace Industry.

**Table 2.1: List of Aerospace Industry Stakeholders (Government Agencies & Industry Association)**

STAKEHOLDER	ROLES AND FUNCTION
1) Malaysian Aerospace Council (MAC)	<p>The Malaysian Aerospace Council (MAC) is a national level steering body which is dedicated to the development of the Aerospace Industry in Malaysia.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>• To provide vision, direction and overall development plan for the National Aerospace Industry.</li> <li>• To provide policy guidelines and identify priority areas of aerospace activities.</li> </ul>
2) Ministry of International Trade and Industry (MITI)	<p>The Ministry of International Trade and Industry (MITI), is responsible for the international trade, industry, investment, productivity, small and medium enterprise, development finance institution, halal industry, automotive, steel, strategic trade.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>• To promote and strategise Malaysia's global competitiveness in international trade by producing high value added goods and services.</li> <li>• To spur the development of industrial activities towards enhancing Malaysia's economic growth for achieving a developed nation status by 2020.</li> </ul> <p>Vision:</p> <ul style="list-style-type: none"> <li>• To make Malaysia the preferred investment destination and among the most globally competitive trading nations by 2020.</li> </ul> <p>Function:</p> <ul style="list-style-type: none"> <li>• To plan, formulate and implement policies on industrial development, international trade and investment.</li> <li>• To encourage foreign and domestic investment.</li> <li>• To promote Malaysia's exports of manufacturing products and services by strengthening bilateral, multilateral, and regional trade relations and cooperation.</li> <li>• To enhance national productivity and competitiveness in the manufacturing sector.</li> </ul> <p>Objectives:</p> <ul style="list-style-type: none"> <li>• To plan, legislate and implement international trade and industrial policies that will ensure Malaysia's rapid development towards achieving National Economic Policy and Vision 2020.</li> </ul>
3) National Aerospace Industry	<p>The National Aerospace Industry Coordinating Office (NAICO) was established in August 2015 to oversee the Malaysian Aerospace Industry Blueprint 2030. NAICO currently operates under the purview of the Ministry of International Trade and Industry (MITI). The objective of</p>



STAKEHOLDER	ROLES AND FUNCTION
Coordinating Office (NAICO)	<p>NAICO is to develop and enhance the competitiveness of the Malaysian Aerospace Industry, which is aligned to the measures and targets specified in the blueprint. With regards to Entry Point Projects (EPPs) and 11<sup>th</sup> Malaysia Plan. NAICO also serves as the focal point in linking to Aerospace Industry players, relevant Government ministries and agencies, academia and research institutions to work together in strengthening the capability and capacity of the local Aerospace Industry.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>• Coordinate the implementation of the Malaysian Aerospace Industry Blueprint 2030.</li> <li>• Coordinate, prioritise, arrange, review, manage, and monitor Aerospace Industry development programmes in the country.</li> <li>• Coordinate the implementation of projects under RMK-11 related to the development of the Aerospace Industry.</li> <li>• Be the referral point for foreign and domestic investors.</li> <li>• Promote and facilitate the involvement of small and medium enterprises into the global supply chain.</li> <li>• Function as the secretariat to the Malaysian Aerospace Council (MAC).</li> </ul>
4) Ministry of Finance (MOF)	<p>The Ministry of Finance (MoF) is a ministry of the Government of Malaysia that is responsible for Government's expenditure and revenue raising. The ministry's role is to develop economic policies and prepare the Malaysian federal budget. The Ministry of Finance also oversees financial legislation and regulation. Each year in October, the Minister of Finance presents the Malaysian federal budget to the Parliament. The Minister of Finance is the minister in charge of government revenue and expenditure. The Minister oversees economic policies and ensures fiscal policy is within the Minister's direct responsibility, while monetary policy is implemented by the politically independent Central Bank of Malaysia, the head of which is appointed by the Yang di-Pertuan Agong. The Minister of Finance also oversees financial legislation and regulation. Each year in October, the Minister of Finance presents the Malaysian federal budget to the Parliament.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>• To shoulder the responsibility for Government expenditure and revenue raising.</li> </ul>
5) Economic Planning Unit (EPU)	<p>The Economic Planning Unit is the principal government agency responsible for the preparation of development plans for the nation. The unit was established in 1961 as the Economic Secretariat of the Economic Committee under the Executive Council of the then Federation of Malaysia. Its objective then was to "focus on development</p>



STAKEHOLDER	ROLES AND FUNCTION
	<p>planning, on major problems in plan execution and on all forms of foreign aid". In that year, the Government also established the National Planning Development Committee with the Economic Planning Unit as its secretariat. While the Cabinet continued to retain the ultimate responsibility for planning in the country, the National Development Planning Committee was assigned the responsibility for the formulation, implementation, progress evaluation and revision of development plans. Since its establishment almost 43 years ago, EPU functions have remained primarily unchanged although it has taken on additional functions in consonance with the changing emphasis of development policy.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>• To facilitate the preparation of the development plans for the nation.</li> </ul>
6) Ministry of Transport (MOT)	<p>The Ministry of Transport is responsible for the formulation and implementation of policies, strategies and programs for transportation, which covers land (private), aviation and maritime sectors. These will ensure better services in providing an efficient, safe and effective transportation system towards strengthening multimodal transportation as well as enhancing the count's competitiveness.</p> <p>Vision:</p> <ul style="list-style-type: none"> <li>• Become the leader of world class transportation system.</li> </ul> <p>Mission:</p> <ul style="list-style-type: none"> <li>• Ensure that the various transport systems that are efficient, sustainable, integrated, secure, and user-friendly.</li> </ul> <p>Objectives:</p> <ul style="list-style-type: none"> <li>• The provision of integrated transport infrastructure network-based supply driven.</li> <li>• Preparation of high-tech transportation system, modern and efficient.</li> <li>• The provision of public transport services and goods that seamless and secure.</li> <li>• Preparation of environment competitive transportation industry.</li> <li>• Provision of effective regulation and enforcement and integrity.</li> </ul>
7) Ministry of Defence (MINDEF)	<p>The Ministry of Defence (MINDEF) is a Ministry of the Government of Malaysia that is responsible for defence, national security, army, navy, hydrography, air force, armed forces, intelligence services, counterintelligence, military intelligence, national service, and veteran's affairs.</p>
8) Ministry of Science and	<p>The Ministry of Science, Technology and Innovation (MOSTI), is responsible for science, technology, innovation, space science,</p>



STAKEHOLDER	ROLES AND FUNCTION
Technology (MOSTI)	<p>chemistry, nuclear, meteorological, standards, atomic energy, remote sensing, design, technology park, biotechnology, astronautics, cyber security, nanotechnology, venture capital, venture debt, and research. It was created in 1973 by the Federal Government as the Ministry of Technology, Research and Local Government and was reformed in 1976 as the Ministry of Science, Technology and Environment (MOSTE). Following the cabinet reshuffle of 2004, MOSTE evolved yet again to its current form.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>To improve competitiveness in the fields of science and technology through the generation of knowledge and sustainable development.</li> </ul>
9) Ministry of Higher Education (MOHE)	<p>The Ministry of Higher Education (MOHE) plays an important role in creating the best ecosystem of higher education in public universities, private higher learning institutions (IPTs), polytechnics as well as community colleges. All these institutions are the country's education and training ecosystem that will generate thinkers, scientists, scholars, highly skilled workers in line with their respective roles. In line with this objective, MOHE has three (3) departments for the management of institutions of higher learning, namely:</p> <ul style="list-style-type: none"> <li>Department of Higher Education - managing the institutions of higher learning (Universities, University Colleges and Colleges).</li> <li>Polytechnic Education Department - manages the polytechnics.</li> <li>Community College Education Department - manages community colleges.</li> </ul> <p>Efforts to achieve this goal are supported by the following agencies, namely:</p> <ul style="list-style-type: none"> <li>Malaysian Qualification Agency (MQA) - a single body that oversees and coordinates quality assurance and national higher education accreditation.</li> <li>National Higher Education Fund Corporation (PTPTN) - a body that manages financing for higher education purposes.</li> </ul>
10) Department of Civil Aviation, Malaysia (DCA)	<p>The Department of Civil Aviation is established under the Ministry of Transport (MoT) Malaysia to provide safe, efficient and orderly flow of air transportation, and to regulate aviation activities in Malaysia. The rapid expansion of Malaysia's aviation and air transport industries is largely due to the pragmatic approach taken by DCA Malaysia in ensuring compliance to standards and recommended practices of the International Civil Aviation Organisation (ICAO).<sup>5</sup></p>

<sup>5</sup> Department of Civil Aviation. Profile. <http://www.dca.gov.my>



STAKEHOLDER	ROLES AND FUNCTION
<p>11) Malaysian National Space Agency (ANGKASA)</p>	<p>The Malaysian National Space Agency (ANGKASA) is responsible in leading and observing the development of space science in Malaysia through the following efforts:</p> <ul style="list-style-type: none"> <li>• Providing leadership in the educational aspect and the research of space science.</li> <li>• Assisting the government in formulating and executing the National Space Fundamentals.</li> <li>• Providing quality service to customers to help achieve the above mentioned goals<sup>6</sup></li> </ul> <p>Vision:</p> <ul style="list-style-type: none"> <li>• Harnessing space as a platform for knowledge generation, wealth creation and societal well-being.</li> </ul> <p>Mission:</p> <ul style="list-style-type: none"> <li>• To develop the country's potential in the space sector to support the development of new economy, generate knowledge and strengthen the national security infrastructure.</li> </ul>
<p>12) Directorate General Technical Airworthiness (DGTA)</p>	<p>The Directorate General Technical Airworthiness (DGTA) was formally approved and established by the Government in July 2010. With the approval for DGTA to become a state agency which is responsible for regulating the technical airworthiness of state-registered aircraft.</p> <p>The establishment of DGTA hence provided a management system and regulatory framework for state technical airworthiness.</p> <p>Vision:</p> <ul style="list-style-type: none"> <li>• To be an internationally recognised state technical airworthiness authority.</li> </ul> <p>Mission:</p> <ul style="list-style-type: none"> <li>• To augment awareness and compliance of technical airworthiness through inculcation of culture, regulation and practice.</li> </ul> <p>Objectives:</p> <ul style="list-style-type: none"> <li>• To provide independent assessment of technical airworthiness for state registered aircraft.</li> <li>• To certify and approve organisations involved in the design and maintenance of state registered aircraft and its associated aeronautical products.</li> <li>• To certify and approve aircraft maintenance training organisations.</li> <li>• To advise state airworthiness authority on all matters related to technical airworthiness.</li> </ul>

<sup>6</sup> <http://www.angkasa.gov.my/?q=en/about-us/introduction>



STAKEHOLDER	ROLES AND FUNCTION
	<ul style="list-style-type: none"> <li>To review, update and amend policies and regulations related to management and enforcement of technical airworthiness requirements.</li> </ul>
<p>13) Malaysian Investment Development Authority (MIDA)</p>	<p>The Malaysian Investment Development Authority (MIDA), previously known as Malaysian Industrial Development Authority is the government's principal agency to oversee and drive investment into the manufacturing and services sectors in Malaysia. Starting humble operations in 1967, MIDA was given the mandate to promote investments in the manufacturing and services sectors; and to advise the Minister of International Trade and Industry (MITI) on industry matters including the formulation of related policies.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>To promote foreign and local investments in the manufacturing and services sectors.</li> <li>To undertake planning for industrial development in Malaysia.</li> <li>To recommend policies and strategies on industrial promotion and development to the Minister of International Trade and Industry.</li> <li>To evaluate applications for manufacturing licenses, and expatriate posts; tax incentives for manufacturing activities, tourism, R&amp;D, training institutions and software development; and duty exemption on raw materials, components and machinery.</li> <li>To assist companies in the implementation and operation of their projects, and offer assistance through direct consultation and co-operation with the relevant authorities at both the federal and state levels.</li> </ul>
<p>14) Malaysia External Trade Development Corporation (MATRADE)</p>	<p>MATRADE's mission to promote Malaysia's export has enabled many local companies to carve new frontiers in global markets. MATRADE continues to put the spotlight on capable Malaysian companies on the international stage, helping make the phrase 'Made-In-Malaysia' synonymous with excellence, reliability and trustworthiness.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>To promote, assist and develop Malaysia's external trade with particular emphasis on the export of manufactured and semi-manufactured products and, on a selective basis, imports.</li> <li>To formulate and implement a national export marketing strategy to promote the export of manufactured and semi-manufactured products.</li> <li>To undertake commercial intelligence and market research and create a comprehensive database of information for the improvement and development of trade.</li> </ul>



STAKEHOLDER	ROLES AND FUNCTION
	<ul style="list-style-type: none"> <li>• To organise training programmes to improve the international marketing skills of the Malaysian exporters.</li> <li>• To enhance and protect Malaysia's international trade interests abroad.</li> <li>• To represent Malaysia in any international forum in respect of any matter relating to trade.</li> <li>• To develop, promote, facilitate, and assist in service areas related to trade.</li> <li>• To advise the Government on matters affecting or in any way connected with trade and to act as the agent of the Government or for any person, body or organisation on such matters.</li> </ul>
15) SME Corporation Malaysia (SME Corp. Malaysia)	<p>SME Corporation Malaysia (SME Corp. Malaysia) is a Central Coordinating Agency under the Ministry of International Trade and Industry Malaysia that formulates overall policies and strategies for Small and Medium Enterprises (SMEs) and coordinates the implementation of SME development programmes across all related Ministries and Agencies. It acts as the central point of reference for research and data dissemination on SMEs, as well as, provides advisory services for SMEs in Malaysia. SME Corp. Malaysia also assumes the role of the Secretariat to the National SME Development Council (NSDC), which is chaired by the Prime Minister of Malaysia. The genesis of SME Corp. Malaysia dates back to 2 May 1996, when a specialised agency was established under the Ministry of International Trade and Industry (MITI) to spur the development of Small and Medium Enterprises (SMEs) by providing infrastructure facilities, financial assistance, advisory services, market access and other support programmes. Known as the Small and Medium Industries Development Corporation (SMIDEC), its aim was to develop capable and resilient Malaysian SMEs to be competitive in the global market.</p> <p>Mission:</p> <ul style="list-style-type: none"> <li>• To formulates overall policies and strategies for Small and Medium Enterprises.</li> </ul>
16) Majlis Amanah Rakyat (MARA)	<p>The Majlis Amanah Rakyat (MARA) is a Malaysian government agency. It was formed to aid, train, and guide Bumiputra (Malays and other indigenous Malaysians) in the areas of business and industry. In addition to MRSMs and the UniKL, vocational and professional colleges are operated by MARA such as Pusat GIAT MARA and Kolej Kemahiran MARA. These vocational colleges give a second lane of higher education to students who are unable to continue their studies in universities. Also offering such education and training are Kolej Kemahiran Tinggi MARA, German-Malaysian Institute, Kolej MARA and Kolej Professional MARA.</p>





STAKEHOLDER	ROLES AND FUNCTION
	Objectives: <ul style="list-style-type: none"> <li>• To aid, train, and guide Bumiputra (Malays and other indigenous Malaysians) in the areas of business and industry.</li> </ul>
17) Malaysia Aerospace Industry Association (MAIA)	MAIA was launched on 28 March 2016, officiated by the Minister of International Trade and Industry. The genesis of MAIA came into being through the patronage and support of the Minister. Thus MAIA is represented in the Malaysian Aerospace Council meetings, chaired by the Minister. Objectives: <ul style="list-style-type: none"> <li>• To promote the development of the commercial Aerospace Industry in Malaysia.</li> <li>• To promote the export of Malaysian aerospace products and services.</li> <li>• To promote, foster, support, represent and protect the interests of the Members of the Association.</li> <li>• To provide a forum for Members of the Association to exchange information and discuss issues of common interests regarding economic, industrial and commercial aerospace activities.</li> </ul>

## 2.3 GOVERNMENT LEGISLATIONS, POLICIES AND INITIATIVES

This section highlights the relevant legislations, government policies and initiatives related to the industry.

### 2.3.1 LEGISLATIONS RELEVANT TO THE AEROSPACE INDUSTRY

The Aerospace Industry is governed by the following legislations:

- a) Civil Aviation Act 1969 (Act 3)
- b) Carriage by Air Act 1974 (Act 148)
- c) Aviation Offences Act 1984 (Act 307)
- d) Airport and Aviation Services (Operating Company) 1991 (Act 467)
- e) International Interest Act in Mobile Equipment (Aircraft) 2006 (Act 659)
- f) Civil Aviation Regulations 2016
- g) Environmental Quality Act 1974 (Act 127)
- h) Communications and Multimedia Act 1998 (Act 588)
- i) Malaysian Communications and Multimedia Commission Act 1998 (Act 589)

Listed below are the elaborations of the Acts and Regulations.

- (i) Civil Aviation Act 1969 (Act 3)

An Act to make better provision in the law relating to Civil Aviation and for matters connected therewith and ancillary to it.



(ii) Carriage By Air Act 1974 (Act 148)

An Act to give effect to certain Conventions relating to carriage by air and to provide for matters connected therewith and ancillary thereto.

(iii) Aviation Offences Act 1984 (Act 307)

An Act to give effect to the Convention on Offences and Certain Acts Committed on Board Aircraft signed at Tokyo on 14<sup>th</sup>. September 1963, the Convention for the Suppression of Unlawful Seizure of Aircraft signed at The Hague on 16 December 1970, the Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation signed at Montreal on 23 September 1971, and the Protocol for the Suppression of Unlawful Acts of Violence at Airports Serving International Civil Aviation, concluded at Montreal on 24 February 1988 and for purposes connected therewith.

(iv) Airport and Aviation Services Act (Operating Company) 1991 (Act 467)

An Act to provide for the vesting of property, rights, and liabilities of the Government of Malaysia relating to civil aviation in a company, to make financial arrangements for that company, to provide for matters relating to staff, and for other matters connected therewith.

(v) International Interest Act in Mobile Equipment (Aircraft) 2006 (Act 659)

An Act to implement the Convention on the International Interests in Mobile Equipment, and the Protocol to that Convention on International Interests in Mobile Equipment on Matters Specific to Aircraft Equipment and to provide for matters connected therewith.

(vi) Civil Aviation Regulations 2016

An Act that stipulates the regulations pertinent to registration and marking of aircraft, licensing of air services, air operators certificate, airworthiness and equipment of aircraft, aircraft crew and licensing, operation of aircraft, fatigue of crew, documents and records, control of air traffic, aerodromes, aeronautical lights and radio stations, investigation of accidents, detention and sale of aircraft, aircraft mortgage, landing, parking and housing, passenger service, and air navigation facility.

(vii) Environmental Quality Act 1974 (Act 127)

An Act relating to the prevention, abatement, control of pollution and enhancement of the environment, and for purposes connected therewith.<sup>7</sup>

(viii) Communications and Multimedia Act 1998 (Act 588)

An Act provided for and to regulate the converging communications and multimedia industries, and for incidental matters. The purpose of this act includes promoting national

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<sup>7</sup> Ecolx. <https://www.ecolx.org/details/legislation/environmental-quality-act-1974-no-127-of-1974-lex-faoc013278/>. Date accessed: 15th April 2017



policy objectives for the communications and multimedia industry. The jurisdiction of this Act is restricted to networked services and activities only.

(ix) Malaysian Communications and Multimedia Commission Act 1998 (Act 589)

The Malaysian Communications and Multimedia Commission was created pursuant to the Malaysian Communications and Multimedia Commission Act (1998) as a new regulator for the communications and multimedia industry in Malaysia. At the same time, the Communications and Multimedia Act (1998) was passed, to fulfil the need to regulate an increasingly convergent communications and multimedia industry.

**2.3.2 GOVERNMENT INITIATIVES**

The Aerospace Industry in Malaysia has grown substantially in the past two decades. The government has put in several national strategies to drive the growth of the Aerospace Industry in Malaysia including the, RMK-11, Entry Point Project (EPP) of the Economic Transformation Programme (ETP), and Malaysian Aerospace Industry Blueprint 2030.

**i. Malaysian Aerospace Industry Blueprint 2030**

The Blueprint was approved by the Cabinet on 13 March 2015 and was launched by the Prime Minister during the Opening Ceremony of LIMA '15.



Figure 2.2: Malaysian Aerospace Industry Blueprint 2030  
(Source: Malaysian Aerospace Industry Blueprint 2030)

## Targets of the Blueprint

- Vision: “By 2030, Malaysia will be the No. 1 Aerospace nation in South East Asia (SEA) and as an integral part of the global market”.
- By 2030, the Aerospace Industry is targeted to generate annual revenue of RM55.2 billion and create more than 32,000 high income jobs.

## Strategies under the Blueprint

- Apply policies that will impact the future landscape of the Aerospace industry;
- Enhance the effectiveness of institutions that have direct influence on the growth of the industry;
- Harmonise civil and military regulations and promote green practices;
- Invest in Research & Technology to develop new capabilities and enhance industry competitiveness;
- Promote aerospace investments through incentives and matching funding;
- Attract and prepare the workforce of tomorrow for Malaysia and the region; and
- Capture new market and strengthen local supply chain.

There are currently 41 key initiatives that have been developed to implement the seven (7) strategies above.

Below are the highlighted Aerospace Focus Areas & Specific Objectives of the blueprint:

No.	Focus Area	Specific Objective
1.	MRO Sub-Sector	Capture at least 5% of Global market share
2.	Aero manufacturing Sub-Sector	Become No. 1 in SEA for Aerospace and Component Sourcing by targeting to be a large assembly Tier-1 and Risk Sharing Partner (RSP)
3.	System Integration Sub-Sector	Self-Reliant (at least 70%) in integration and upgrading of strategic assets.
4.	Engineering and Design Services Sub-Sector	Capture at least 3.5% of Global market share
5.	Education and Training Sub-Sector	No.1 in South East Asia in supplying competent workforce

Below is the Key Performance Index (KPIs) for 5 focus areas:

No.	Focus Area	2015	2020	2025	2030
1.	Maintenance, Repair and Overhaul (Global Market Share)	3.0%	3.5%	4.0%	5.0%



No.	Focus Area	2015	2020	2025	2030
2.	Aero manufacturing (Position in South East Asia)	No. 2	No. 2	No. 1	No. 1
3.	System Integration (Local Content)	10 %	30 %	50 %	70 %
4.	Engineering and Design Services (Global Market Share)	0.03 %	2 %	3.0 %	3.5 %
5.	Aerospace Training and Education (Position in South East Asia)	-	No. 1	No. 1	No. 1

## ii. Eleventh Malaysia Plan, 2016-2020 (RMK 11)

The Eleventh Malaysia Plan, 2016-2020, is the final leg in the journey towards realising Vision 2020. Launched in 1991, Vision 2020 envisions Malaysia as a fully developed country along all dimensions; economically, politically, socially, spiritually, psychologically, and culturally.

The Eleventh Malaysian Plan is based on the theme “anchoring growth on people”. It has six strategic thrusts and six game changers that will transform ideas into reality and address the goals set out in Vision 2020, Malaysia will thus be catapulted towards the end state of being an advanced economy and inclusive nation. It will:

- Move towards complex and diverse products.
- Enhance productivity through automation and innovation.
- Stimulating innovation-led growth.
- Strengthening growth enablers.
- Ramping up internationalisation.

There are 2 key initiatives, which are aerospace development programmes under RMK11. They are the Aerospace Industry Development Program and Aerospace Composites Research.

## iii. Economic Transformation Programme (ETP)

Launched on 25 September, 2010, the Economic Transformation Programme (ETP) was formulated as part of Malaysia's National Transformation Programme. Its goal is to elevate the country to a developed-nation status by 2020, targeting GNI per capita of US\$15,000. This will be achieved by attracting US\$444 billion in investments which will, in turn, create 3.3 million new jobs.

ETP's targets for 2020 will be achieved through the implementation of 12 National Key Economic Areas (NKEAs), representing economic sectors which account for significant contributions to the GNI. The programme is also centred on raising Malaysia's competitiveness through the implementation of six Strategic Reform Initiatives (SRIs). The SRIs comprise policies which strengthen the country's commercial environment to ensure Malaysian companies are globally competitive.



Under the Government's ETP, the Aerospace Industry has been identified as a source of growth under Business Services – New Key Economic Areas (NKEA) namely:

- a. EPP1: Growing Aviation Maintenance, Repair and Overhaul Services
- b. EPP5: Nurturing Pure-Play Engineering Services
- c. EPP7: Making Malaysia the Hub for Aerospace OEM in South East Asia
- d. EPP8: Developing SMEs in the Global Aerospace Manufacturing Industry

#### **iv. Aerospace Malaysia Innovation Centre (AMIC)**

In order to realise Malaysia's needs to focus on industry-led Research & Technology (R&T) to remain competitive at the global level, the Malaysian Aerospace Council (MAC) held in December 2010 chaired by the Honourable Prime Minister of Malaysia, Dato' Seri Mohd. Najib bin Tun Abdul Razak, established the Aerospace Malaysia Innovation Centre (AMIC).

AMIC is an industry led innovation centre to enhance the competitiveness of Malaysian Aerospace Industry at the global arena. The main objective of AMIC is to foster a collaborative environment unifying both industry players and research institutes particularly in areas of R&T. The centre is described as an innovative model which will substantially improve the commercial success of aerospace R&T projects undertaken in Malaysia.

AMIC's core business is to embark on collaborative R&T projects, in collaboration with industries and research institutes in the aerospace sector. Research projects are spearheaded by founding lead members, namely, Airbus Group, Rolls Royce and Composites Technology Research Malaysia (CTRM). The engagement with OEMs that are championing the global Aerospace Industry namely Airbus Group and Rolls-Royce is one of the critical components in ensuring AMIC focuses on future directions of the global Aerospace Industry particularly Industry Revolution 4.0 or AMIC's "Factory of The Future" initiative.

In particular, AMIC is focusing on the following areas:

- Virtual Reality.
- Advanced digital technologies on the shop floor.
- Advanced material; 3D printing to prototypes and series of components.
- Automation in manufacturing process; production lines where computer-suited personnel and robots work side by side.

## **2.4 INDUSTRY INTELLIGENCE**

This section provides an overview of the relevant factors which have substantial impact on the industry. Such information may be used to forecast the future manpower needs of the industry and to influence the necessary manpower planning.

### **2.4.1 Industry Key Strengths**

#### **2.4.1.1 Malaysian Aerospace Industry Milestones**

The Asia Pacific region is set to become the world's largest air travel market. Airbus forecasted that Asia Pacific will account 41% of the demand by 2036, with the North America



and Europe together representing 36%.<sup>8</sup> Opportunities exist in the following sectors and Table 2.2 below shows some of the milestones of the Malaysian Aerospace Industry.

- Manufacturing of aircraft parts and components.
- Manufacturing/assembly base for light aircraft and corporate planes.
- MRO activities for aircraft, engine and component.
- Engineering services activities.

**Table 2.2: Aerospace Industry Milestones**

NO	STRATEGIC NATIONAL PROGRAMMES	YEAR
1	First communications satellite, MEASAT-1	1996
2	National Aerospace Blueprint (charts the development plan to transform Malaysia's aerospace industry into a dynamic regional and international aerospace player by 2015)	1997
3	Launching of remote sensing satellite – TiungSAT-1	2000
4	Establishment of Malaysian Aerospace Council (MAC)	2001
5	Transformation of Subang International Airport into Malaysia International Aerospace Centre (MIAC) to become a regional MRO hub	2005
6	Launching of second remote sensing satellite – RazakSAT	2009
7	Launching of Aerospace Malaysia Innovation Centre (AMIC) to intensify aerospace Research & Technology (R&T) activities	2011
8	Launch of Aerospace Blueprint 2015-2030	2015
9	Reinstate MAC under MITI	2015
10	Establishment of National Aerospace Industry Coordinating Office (NAICO) under MITI	2015
11	EPP8: SMEs Development Program	2016
12	RMK11: Aerospace Industry Development Program	2016
13	RMK11: Aerospace Composites Research	2016
14	Critical Occupations List (COL) for Aerospace Industry	2016
15	13 Key Initiatives of the Blueprint Implemented	2017
16	Industry Collaboration Program (ICP) Strategy for Aerospace Industry	2017
17	Malaysia Aerospace Summit 2017 (MyAero '17)	2017
18	Development of National Aerospace Research & Technology Roadmap	2017
19	NAICO as Industry Lead Body for Aerospace Industry	2017

#### 2.4.1.2 Economic Performance of the Aerospace Industry

The Malaysian Aerospace Industry has been growing at approximately 8% per annum from 2012 to 2016.<sup>9</sup> This is due to higher air traffic and thus increasing the demand for aircrafts and increase of foreign investments into Malaysia.

Globally, total MRO business is forecasted to grow from USD57.7 billion to USD86.8 billion or 4.2% over the next ten years (2014-2024). Malaysia's MRO sub-sector's turnover has grown from RM4.3 billion in 2009 to RM5.7 billion in 2016. The MRO sub-sector is expected

<sup>8</sup>Source from Airbus Global Market Forecast 2017-2036 "Growing Horizons". Blagnac. ISBN-978-2-9554382-2-6

<sup>9</sup> National Aerospace Industry Coordinating Office (NAICO)



to revive in the coming years based on the expansion of MRO activities in Malaysia. The MRO sub-sector is projected to contribute RM 8.3 billion in Gross National Income (GNI) by 2020. Currently, there are about 64 MRO companies operating in Malaysia.

The aero manufacturing sub-sector's turnover has expanded from RM0.6 billion in 2009 to RM6.4 billion in 2016. The investment of Honeywell Aerospace Avionics in 2009 has opened up opportunities for Malaysia to venture into avionics manufacturing. The engine parts and components manufacturing set its footprint in Malaysia with the investment by Singapore Aerospace Manufacturing (SAM) Group through its subsidiary Aviatron Sdn. Bhd. to undertake nacelle machined assemblies.

South East Asia will experience 7% year-on-year growth for graduate engineers and 5% for technicians by 2032. The E&T players are in position to satisfy the demand for aerospace engineers and technicians in ASEAN based on Malaysia accumulative capacity of churning 50,751 technicians, and 15,556 graduates engineer by 2030.

Total trade for aerospace products in 2016 stood at RM17.47 billion. The exports of Malaysia's aerospace products, primarily the aerospace parts and components, recorded a significant increase of 47.9% from RM2.9 billion in 2014 to RM5.53 billion in 2016.<sup>10</sup> Exports were mainly to USA, UK, Singapore, Japan and Thailand. Meanwhile, imports stood at RM11.94 billion. Malaysia's main import items were mainly aircrafts and their parts. Most of the aircraft and parts were imported from USA, France, Singapore, Netherlands and UK.<sup>11</sup>

## 2.4.2 Industry Challenges

The industry faces a number of challenges such as:

- The high level of product specification in this industry requires companies to invest heavily on technical competency, infrastructural capabilities such as obtaining and maintaining highly skilled workforce.
- Local aerospace manufacturing companies in Malaysia are required to increase their capabilities to obtain the recognition of global players and OEMs.
- The industry is highly regulated where it is governed with standards and regulations.
- There is a need to enhance local skillsets specifically in aerospace industry which requires engineers, technologists and highly skilled technicians.
- Capability constraints in overhaul parts/components.
- High capital investments by aerospace related companies are required due to the high cost of aviation set up.
- Competition from other regional industry players requires local players to increase their competitive edge.
- The need to increase industry participation and funding in Research & Technology activities.

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<sup>10</sup> Malaysian Investment Development Authority (MIDA)

<sup>11</sup> Malaysia External Trade Development Corporation (MATRADE)





- There is a need of industry players to develop local talents to implement Industry Revolution 4.0.

### **2.4.3 Aerospace Industry Technology Trend – Industry Revolution 4.0 (IR4.0)**

Technology trends such as large amounts of data generation by the Aerospace Industry (from an order book of over 3500 Geared Turbo Fan (GTF) engines), demand for sustainable aircraft, sustainable aviation fuel and growing preference for a full information system in MRO have driven the industry to adopt Industry Revolution 4.0 solutions.

#### **2.4.3.1 Background of IR4.0**

IR4.0 is a technological revolution, which starts from the First Industrial Revolution to the Third Industrial Revolution. Briefly, the First Industrial Revolution used water and steam power to mechanise production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. The Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterised by a fusion and convergence of technologies that cut across the physical, digital, and biological spheres.

The speed of current breakthroughs of IR4.0 is evolving at an exponential rate rather than a linear pace. The breadth and depth of these changes will transform the entire systems of production, management, and governance to different latitude. The possibilities of new technological innovations and creation will be multiplied by the emerging technology breakthroughs in fields such as artificial intelligence, robotics, the Internet of Things (IoT), 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing.

The challenge of IR4.0 is the demand for highly skilled workers, which will increase, while the demand for workers with less education and lower skills will decrease.

#### **2.4.3.2 Malaysian Aerospace Industry on IR4.0**

Implementation of IR4.0 in the Aerospace Industry has enabled the industry to develop lighter and more efficient aircraft, integrate operation feedback in real time to relevant personnel such as the design team and allows for higher productivity in the manufacturing process.

IR4.0 solutions which are applicable to the Aerospace Industry include; Advanced Material, Internet of Things (IoT), Augmented Reality, Automation/Robotics, Additive Manufacturing (AM), Model-based Design , Big Data Analytics and Block Chain.

The advantages of some of the IR4.0 solutions to the Malaysian Aerospace Industry such as Advanced Material where Malaysian companies have shown capability in advanced materials such as composite manufacturing and testing, where this can be one of our competitive edge in terms of Advanced Materials manufacturing. IoT and Big Data Analytics allow increase in data collection, prediction of possible failure patterns etc. Innovation and capability in this



technology is possible as Malaysia has a strong network of IoT and Big Data Analytics' professionals who can assist and consult the Aerospace Industry in its development. Aircraft production business worldwide is expanding, where the global aerospace suppliers have to cope with the growing demands of the OEMs. Hence, it has led the OEMs to implement IR4.0 or Smart Factory concepts at the aircraft productions and assembly plants. Not limited to their own facilities and subsidiaries, the OEMs are also encouraging their global suppliers to adopt IR4.0 throughout their supply chain.

#### **i. IR4.0 Initiatives by OEMs**

Among the current initiatives by the OEMs are as follows:

##### **(a) Airbus Group**

Airbus has been developing three smart tool families that can be utilised in different stages of the production process: drilling, measuring, and quality data logging and tightening. "Factory of the Future" is an on-going research and technology project and is largely based on human skills and competences.

##### **(b) Boeing**

Boeing is implementing IR4.0 by building the "smart factory" that combines the elements of data collection & collation, combining data in planning, monitoring, diagnosing & improving manufacturing situations, employing Natural Language processing and using integrated software for data acquisition, processing & analytics.

##### **(c) Safran Group**

Safran is a leading aerospace player in implementing the IR4.0 initiatives. Safran's manufacturing facilities globally are being monitored through integrated systems connecting the machines with IoT as the backbone. At the engine assembly facilities, systems are being integrated together as part of the assembly systems, such as an augmented reality system for engine components installation, Robotics jigs, autonomous indoor vehicle and RFID's tools detection system

##### **(d) GE's Brilliant Factory**

GE Brilliant Factory is a sophisticated factory that combines lean manufacturing, advanced and additive manufacturing with advanced software analytics to enhance productivity.

#### **ii. IR4.0 Initiatives by the Malaysian Aerospace Industry**

Following OEM's directions in implementing IR4.0 or Smart Manufacturing, the Malaysian Aerospace Industry players have also started to introduce initiatives to improve their manufacturing/assembly processes in order to increase their productivity and efficiency. This is also in line with the recommendation of Malaysian Aerospace Industry Blueprint 2030 to "Invest in Research & Technology (R&T) to Develop New Capabilities and Enhance Industry Competitiveness".



Below are the local industry players that are currently implementing the IR4.0 solutions.

**(a) Aerospace Malaysia Innovation Centre (AMIC)**

*(Refer the description in Section 2.3.2 (v) above)*

**(b) Composites Technology Research Malaysia (CTRM)**

CTRM is currently leveraging on AMIC's strength on R&T to evaluate the following technologies to be integrated with production management systems, which include:

- Automation of Hand Layup manufacturing process using Automatic Tape Layup technology in producing complex aerospace products
- Utilisation of Virtual Reality for shop floor optimisation

**(c) UMW Aerospace**

UMW Aerospace's facility has been designed ground up to be IR4.0 ready. With highly advanced machines and equipment, UMW Aerospace aims to integrate the manufacturing systems to enhance the efficiency of its production capability. UMW Technology on the other hand will spearhead Internet of Things (IoT) technology and services capability development.



## 2.5 OCCUPATIONAL STRUCTURE OVERVIEW

### 2.5.1 MALAYSIAN STANDARD INDUSTRY CLASSIFICATION (MSIC) SECTIONS RELEVANT TO THE AEROSPACE INDUSTRY OCCUPATIONAL STRUCTURE

The Malaysian Standard Industry Classification (MSIC) is used as the main reference for the classification of the Occupational Structure's sub-sectors. In the MSIC 2008, the Aerospace Industry falls under several sections which are; Section C: Manufacturing, Section M: Professional, Scientific and Technical Activities and Section H: Transportation & Storage. The Aerospace Industry is related to the MSIC Sections and Divisions listed below:

MSIC Section & Division / Aerospace Industry Sub-sectors	Maintenance Repair and Overhaul (MRO)	Aircraft Manufacturing	System Integration	Engineering & Design	Continuing Airworthiness Management Organisation (CAMO)	Aerospace Support Services
<b>Section C: Manufacturing</b>						
Division 28 - Manufacture Of Machinery And Equipment		X				
Division 30 - Manufacture Of Other Transport Equipment		X				
Division 33 - Repair And Installation Of Machinery And Equipment	X					
<b>Section M, Professional, Scientific And Technical Activities</b>						
Division 71 - Technical Testing And Analysis			X	X	X	
<b>Section H, Transportation &amp; Storage</b>						
Division 51, Air Transport						X

Each MSIC Section is further divided into Division, Group and Class which are the further breakdown of the categorisation based on economic activities, the elaboration of what each Section includes in terms of economic activities can be seen in the details provided below.

#### Section C: Manufacturing



This section, Section C: Manufacturing, describes the output of a manufacturing process that may be finished in the sense that it is ready for utilisation or consumption, or it may be semi-finished in the sense that it is to become an input for further manufacturing. This includes the manufacture of unspecialised components and parts of machinery and equipment, e.g.: engines, pistons, electric motors, electrical assemblies, valves, gears, roller bearings, is classified in the appropriate class of manufacturing, without regard to the machinery and equipment in which these items may be included. Assembly of the component parts of manufactured products is considered manufacturing. This includes the assembly of manufactured products from either self-produced or purchased components.

Division 33 includes the manufacture of machinery and equipment that act independently on materials either mechanically or thermally or perform operations on materials (such as handling, spraying, weighing or packing), including their mechanical components that produce and apply force, and any specially manufactured primary parts. This includes the manufacture of special equipment for passenger or freight transport within demarcated premises also belongs within this division.

Group 282 includes the manufacture of special-purpose machinery, i.e.: machinery for exclusive use in an MSIC industry or a small cluster of MSIC industries. While most of these are used in other manufacturing processes, this group also includes the manufacture of machinery specific for other (non-manufacturing industries), such as aircraft launching gear.

▪ <b>Section:</b>	<b>C</b>	<b>MANUFACTURING</b>
▪ <b>Division:</b>	<b>28</b>	<b>MANUFACTURE OF MACHINERY AND EQUIPMENT n.e.c.</b>
▪ <b>Group:</b>	<b>282</b>	<b>Manufacture of special-purpose machinery</b>
▪ <b>Class</b>	<b>2829</b>	<b>Manufacture of other special-purpose machinery</b>
<b>Includes:</b>		
(i) Manufacture of machinery for working soft rubber or plastics or for the manufacture of products of these materials such as extruders, moulders, pneumatic tyre making or rethreading machines and other machines for making a specific rubber or plastic product.		
(ii) Machinery for producing tiles, bricks shaped ceramic pastes, pipes, graphite electrodes, blackboard chalk, foundry moulds, etc.		
(iii) Manufacture of semi-conductor manufacturing machinery , manufacture of diverse special-purpose machinery and equipment such as machines to assemble electric or electronic lamps, tubes (valves) or bulbs; machines for production or hot-working of glass or glassware, glass fibre or yarn machinery or apparatus for isotopic separation.		
(iv) Manufacture of tire alignment and balancing equipment; balancing equipment (except wheel balancing).		
(v) Manufacture of central greasing systems.		
(vi) Manufacture of aircraft launching gear, aircraft carrier catapults and related equipment.		

Division 30 includes the manufacture of transportation equipment such as air and spacecraft and the manufacture of parts thereof. Group 303 includes manufacture of airplanes for the transport of goods or passengers, for use by the defence forces, manufacture of helicopters, manufacture of parts and accessories of the aircraft of this group such as major assemblies



such as fuselages, wings, doors, control surfaces, landing gear, fuel tanks, nacelles, etc., airscrews, helicopter rotors and propelled rotor blades, motors and engines of a kind typically found on aircraft, parts of turbojets and turboprops for aircraft, manufacture of ground flying trainers, manufacture of spacecraft and launch vehicles, satellites, planetary probes, orbital stations, shuttles, overhaul and conversion of aircraft or aircraft engines and manufacture of aircraft seats.

▪ <b>Section:</b>	<b>C</b>	<b>MANUFACTURING</b>
▪ <b>Division:</b>	<b>30</b>	<b>MANUFACTURE OF OTHER TRANSPORT EQUIPMENT</b>
▪ <b>Group:</b>	<b>303</b>	<b>Manufacture of air and spacecraft and related machinery</b>
▪ <b>Class:</b>	<b>3030</b>	<b>Manufacture of air and spacecraft and related machinery</b>
<b>Includes:</b>		
(i) Manufacture of airplanes for transport of goods or passengers, for use by the defence forces, for sport or other purposes.		
(ii) Manufacture of helicopters.		
(iii) Manufacture of parts and accessories of the aircraft of this class:		
a. Major assemblies (e.g. Fuselages, wings, doors, control surfaces, landing gear, fuel tanks, nacelles, lighting equipment, etc.)		
b. Airscrews, helicopter rotors and propelled rotor blades		
c. Motors, engines and parts of a kind typically found on aircraft		
d. Parts of turbojets and turbo propellers for aircraft		
(iv) Manufacture of aircraft seats.		
(v) Manufacture of ground flying trainers.		
(vi) Manufacture of spacecraft and launch vehicles, satellites, planetary, probes, orbital stations, shuttles, etc.		
(vii) Overhaul and conversion on aircraft or aircraft engines.		
(viii) Factory rebuilding of aircraft.		

Division 33 includes the specialised repair of goods produced in the manufacturing sector with the aim to restore machinery, equipment and other products to working order. The provision of general or routine maintenance (i.e. servicing) on such products to ensure they work efficiently and to prevent breakdown and unnecessary repairs is included. This division does only include specialised repair and maintenance activities. A substantial amount of repair is also done by manufacturers of machinery, equipment and other goods, in which case the classification of units engaged in these repair and manufacturing activities is done according to the value added principle which would often assign these combined activities to the manufacture of the goods. The same principle is applied for combined trade and repair. The rebuilding or remanufacturing of machinery and equipment is considered a manufacturing activity and included in other divisions of this section.

▪ <b>Section:</b>	<b>C</b>	<b>MANUFACTURING</b>
▪ <b>Division:</b>	<b>33</b>	<b>REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT</b>



▪ <b>Group:</b>	<b>331</b>	<b>Repair of fabricated metal products, machinery and equipment</b>
▪ <b>Class:</b>	<b>3313</b>	<b>Repair of electronic and optical equipment</b>
<b>Includes:</b>		
(i) Repair and maintenance of aircraft engine instruments.		
(ii) Repair and maintenance of automotive emissions testing equipment © repair and maintenance of meteorological instruments.		
(iii) Repair and maintenance of physical, electrical and chemical properties testing and inspection equipment.		
(iv) Repair and maintenance of surveying instrument.		
(v) Repair and maintenance of radiation detection and monitoring instruments.		
▪ <b>Section:</b>	<b>C</b>	<b>MANUFACTURING</b>
▪ <b>Division:</b>	<b>33</b>	<b>REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT</b>
▪ <b>Group:</b>	<b>331</b>	<b>Repair of fabricated metal products, machinery and equipment</b>
▪ <b>Class:</b>	<b>3315</b>	<b>Repair of transport equipment, except motor Vehicles</b>
<b>Includes:</b>		
(i) Repair and maintenance of aircraft (except factory conversion, factory overhaul, factory rebuilding).		
(ii) Repair and maintenance of aircraft engines.		

### Section M: Professional, Scientific And Technical Activities

Section M includes specialised professional, scientific and technical activities. These activities require a high degree of training, and make specialised knowledge and skills available to users. This section includes architecture and engineering activities, technical testing and analysis, scientific research and development, other professional, scientific and technical activities.

Division 71 includes the provision of architectural services, engineering services, drafting services, the performance of physical, chemical, and other analytical testing services. Group 711 includes the provision of engineering services, drafting services and the like. Whereas group 712 includes the performance of physical, chemical and other analytical testing of all types of materials and products; certification of products, testing with use of models or mock-ups (e.g. of aircraft, ships, dams, etc.) and etc.

▪ <b>Section:</b>	<b>M</b>	<b>PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES</b>
▪ <b>Division:</b>	<b>71</b>	<b>ARCHITECTURAL AND ENGINEERING ACTIVITIES; TECHNICAL TESTING AND ANALYSIS</b>



▪ <b>Group:</b>	<b>711</b>	<b>Architectural and engineering activities and related technical Consultancy</b>
▪ <b>Class:</b>	<b>7110</b>	<b>Architectural and engineering activities and related technical consultancy</b>
<b>Includes:</b>		
<p>(i) Engineering design (i.e. Applying physical laws and principles of engineering in the design of machines, materials, instruments, structures, processes and systems) and consulting activities for:</p> <ol style="list-style-type: none"> <li>a. Machinery, industrial processes and industrial plant</li> <li>b. Projects involving civil engineering, hydraulic engineering, traffic engineering</li> <li>c. Projects elaboration and realisation relative to electrical and electronic engineering, mechanical, industrial and systems engineering, safety engineering</li> <li>d. Project management activities related to construction</li> </ol> <p>(ii) Elaboration of projects using air conditioning, refrigeration, sanitary and pollution control engineering, acoustical engineering, etc.</p>		

▪ <b>Section:</b>	<b>M</b>	<b>PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES</b>
▪ <b>Division:</b>	<b>71</b>	<b>ARCHITECTURAL AND ENGINEERING ACTIVITIES; TECHNICAL TESTING AND ANALYSIS</b>
▪ <b>Group:</b>	<b>712</b>	<b>Technical testing and analysis</b>
▪ <b>Class</b>	<b>7120</b>	<b>Technical testing and analysis</b>
<b>Includes:</b>		
<p>(i) Performance of physical, chemical and other analytical testing of all types of materials and products:</p> <ol style="list-style-type: none"> <li>a. Acoustics and vibration testing</li> <li>b. Testing of composition and purity of minerals, etc.</li> <li>c. Testing of physical characteristics and performance of materials, such as strength, thickness, durability, electrical conductivity, radioactivity,</li> <li>d. Qualification and reliability testing</li> <li>e. Performance testing of complete machinery: motors, automobiles, electronic equipment whether or not with the use of models or mock-ups of ships, aircraft, dams, etc.</li> <li>f. Radiographic testing of welds and joints</li> <li>g. Failure analysis</li> </ol> <p>(ii) Certification of products, including aircrafts, pressurised containers, etc.</p>		

## Section H: Transportation and Storage

Section H includes the provision of passenger or freight transport, whether scheduled or not, by air and associated activities such as terminal facilities etc. Division 51 includes the transport of passengers or freight by air or via space. Group 511 includes transport of passengers by air over regular routes and on regular schedules, and general aviation activities such as transport





of passengers. Group 512 includes transport freight by air over regular routes and on regular schedules, non-scheduled transport of freight by air and launching of satellites and space vehicles.

▪ <b>Section:</b>	<b>H</b>	<b>TRANSPORTATION AND STORAGE</b>
▪ <b>Division:</b>	<b>51</b>	<b>AIR TRANSPORT</b>
▪ <b>Group:</b>	<b>511</b>	<b>Passenger air transport</b>
▪ <b>Class</b>	<b>5110</b>	<b>Passenger air transport</b>
<b>Includes:</b>		
(i) Charter flights for passengers (e.g. Helicopter, etc.).		
(ii) Scenic and sightseeing flights.		
(iii) General aviation activities (e.g. transport of passengers by aero clubs for instruction or pleasure).		

▪ <b>Section:</b>	<b>H</b>	<b>TRANSPORTATION AND STORAGE</b>
▪ <b>Division:</b>	<b>51</b>	<b>AIR TRANSPORT</b>
▪ <b>Group:</b>	<b>512</b>	<b>Freight air transport</b>
▪ <b>Class</b>	<b>5120</b>	<b>Freight air transport</b>
<b>Includes:</b>		
(i) Launching of satellites and space vehicles.		
(ii) Space transport.		

## 2.5.2 EXISTING NATIONAL OCCUPATIONAL SKILLS STANDARDS (NOSS) RELEVANT TO THE AEROSPACE INDUSTRY



Currently there are several National Occupational Skills Standards (NOSS) developed by JPK that are relevant to the sub-sectors and areas in the Aerospace Industry. The details of the existing NOSS relevant to the Aerospace Industry are in the tables below.<sup>12</sup>

**Table 2.3: Relevant Aerospace NOSS – Aircraft Maintenance (Mechanical/Avionics)**

	<b>Pesawat (Mekanikal) (Aircraft (Mechanical))</b>	<b>Pesawat (Avionik) (Aircraft (Avionics))</b>	
<b>L5</b>	<b>TP-060-5:2013</b> Operasi Penyelenggaraan Pesawat dan Persijilan <i>Aircraft Maintenance Operation and Certification</i> (25-10-10),(30-12-2013)	<b>TP-071-5</b> Jurutera Penyelenggaraan Pesawat Avionik (Elektrik) <i>Aircraft Maintenance Engineer Avionics (Electrical)</i> (25-10-10)	<b>TP-072-5</b> Jurutera Penyelenggaraan Pesawat Avionik (Instrumen) <i>Aircraft Maintenance Engineer Avionics (Instrument)</i> (25-10-10)
<b>L4</b>	<b>TP-060-4:2013</b> Operasi Penyelenggaraan Pesawat dan Persijilan <i>Aircraft Maintenance Operation and Certification (Limited Maintenance Authorisation)</i> (25-10-10),(30-12-2013)	<b>TP-070-4</b> Juruteknik Penyelenggaraan Pesawat (Avionik) <i>Aircraft Maintenance Technician (Avionics)</i> (25-10-10)	
<b>L3</b>	<b>TP-060-3:2013</b> Operasi Penyelenggaraan Pesawat (Tidak Dipersijilkan) <i>Aircraft Maintenance Operation (Non Certifying)</i> (24-09-98) (07-10-99) (30-12-2013)		
<b>L2</b>	Tiada Tahap (No Level)		
<b>L1</b>			

**Table 2.4: Relevant Aerospace NOSS – Aircraft Structure Repair**

	<b>Pesawat- Pembaikan Struktur (Aircraft Structure Repair)</b>

<sup>12</sup> Source of the NOSS listed is the NOSS Registry June 2017



L5	Belum ada (Not Available)	
L4	Belum ada (Not Available)	
L3	<b>TP-076-3:2012</b> Pembaikan Struktur Pesawat-Komposit <i>Aircraft Structure Repair-Composite</i> (23-10-12)	<b>TP-073-3:2012</b> Pembaikan Struktur Pesawat-Kepingan Logam <i>Aircraft Structure Repair-Sheet Metal</i> (23-10-12)
L2	Tiada Tahap (No Level)	
L1	Tiada Tahap (No Level)	

**Table 2.5: Relevant Aerospace NOSS – Aviation Welding & Painting**

	<b>Kimpalan (Aviation Welding)</b>	<b>Pengecatan (Aviation Painting)</b>
L5	Belum ada (Not Available)	
L4	Belum ada (Not Available)	
L3	<b>TP-074-3:2012</b> Kimpalan Pesawat <i>Aviation Welding</i> (18-12-2012)	<b>TP-075-3:2012</b> Pengecatan Pesawat <i>Aviation Painting</i> (18-12-2012)
L2	<b>TP-074-2:2012</b> Kimpalan Pesawat <i>Aviation Welding</i> (18-12-2012)	<b>TP-075-2:2012</b> Pengecatan Pesawat <i>Aviation Painting</i> (18-12-2012)
L1	<b>TP-074-1:2012</b> Kimpalan Pesawat <i>Aviation Welding</i> (18-12-2012)	<b>TP-075-1:2012</b> Pengecatan Pesawat <i>Aviation Painting</i> (18-12-2012)

**Table 2.6: Relevant Aerospace NOSS – Aircraft Interior Maintenance**

	<b>Penyelenggaraan Pesawat (Air Craft Maintenance)</b>	<b>Peralatan Sokongan Darat Pesawat (Aircraft Ground Support Equipment)</b>
L5	Belum ada (Not Available)	
L4	Belum ada (Not Available)	
L3	<b>TP-040-3:2016</b> Sokongan Penyelenggaraan Dalam Pesawat <i>Air Craft Interior Maintenance Support</i> (23-06-2009)(24-05-2016)	
L2	Tiada Tahap (No Level)	

**Table 2.7: Relevant Aerospace NOSS – Non Destructive Testing**

<b>Perkhidmatan NDT (Non Destructive Testing Services)</b>
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	<b>Pengujian Arus Pusar (Eddy Current Testing)</b>	<b>Pengujian Radiograf (Radiographic Testing)</b>
L5	Belum Ada (Not Available)	
L4		
L3	<b>MC-116-3:2014</b> Pengujian Arus Pusar – Bahan, Komponen & Struktur Aeroangkasa <i>Eddy Current Testing(ET)- Aerospace Materials, Components &amp; Structures</i> (16-12-2014)	<b>MC-117-3:2014</b> Pengujian Radiograf – Bahan, Komponen & Struktur Aeroangkasa <i>Radiographic Testing(RT)- Aerospace Materials, Components &amp; Structures</i> (16-12-2014)
L2	<b>MC-116-2:2014</b> Pengujian Arus Pusar – Bahan, Komponen & Struktur Aeroangkasa <i>Eddy Current Testing(ET)- Aerospace Materials, Components &amp; Structures</i> (16-12-2014)	<b>MC-117-2:2014</b> Pengujian Radiograf – Bahan, Komponen & Struktur Aeroangkasa <i>Radiographic Testing(RT)- Aerospace Materials, Components &amp; Structures</i> (16-12-2014)
L1	<b>MC-116-1:2014</b> Pengujian Arus Pusar – Bahan, Komponen & Struktur Aeroangkasa <i>Eddy Current Testing(ET)- Aerospace Materials, Components &amp; Structures</i> (16-12-2014)	<b>MC-117-1:2014</b> Pengujian Radiograf – Bahan, Komponen & Struktur Aeroangkasa <i>Radiographic Testing(RT)- Aerospace Materials, Components &amp; Structures</i> (16-12-2014)

**Table 2.7: Relevant Aerospace NOSS – Non Destructive Testing (Continued)**

	<b>Aeroangkasa-Ujian Tanpa Musnah (NDT) Aerospace Non-Destructive Testing (NDT)</b>
L5	(Not Available)
L4	
L3	<b>MC-062-3</b> Penguji Ultrasonik Aeroangkasa <i>Aerospace Ultrasonic Tester (UT)</i> (25-10-10)
L2	<b>MC-062-2</b> Penguji Ultrasonik Aeroangkasa <i>Aerospace Ultrasonic Tester (UT)</i> (25-10-10)
L1	<b>MC-062-1</b> Penguji Ultrasonik Aeroangkasa <i>Aerospace Ultrasonic Tester (UT)</i> (25-10-10)

**Table 2.8: Relevant Aerospace NOSS – Composite Manufacturing**



	<b>Pembuatan Komposit Composite Manufacturing</b>
<b>L5</b>	<b>MT-010-5:2013</b> Pengurusan Pembuatan Komposit <i>Composite Manufacturing Management</i> (10-12-10) (30-12-2013)
<b>L4</b>	<b>MT-010-4:2013</b> Pentadbiran Pembuatan Komposit <i>Composite Manufacturing Administration</i> (10-12-10) (30-12-2013)
<b>L3</b>	<b>MT-010-3:2013</b> Operasi Pembuatan Komposit (Aeroangkasa) <i>Composite Manufacturing Operation (Aerospace)</i> (30-12-2013)
<b>L2</b>	<i>No Level</i>
<b>L1</b>	<i>No Level</i>

**Table 2.9: Relevant Aerospace NOSS – In-flight Services**

	<b>Perkhidmatan Dalam Penerbangan (In-Flight Services)</b>	<b>Operasi Lapangan Terbang (Airport Operations)</b>	<b>Zone Komersial Bebas Free Commercial Zone (FCZ)</b>
<b>L5</b>	Belum ada (Not Available)	<b>TP-804-5:2016</b> Airport Landside, Terminal & Airside Operations Management (04-02-2016)	<b>TP-805-5:2014</b> Pengurusan Zon Komersial Bebas Free Commercial Zone Management (16-12-2014)
<b>L4</b>		<b>TP-804-4:2016</b> Airport Landside, Terminal & Airside Operations Administration (04-02-2016)	<b>TP-805-4:2014</b> Pentadbiran Zon Komersial Bebas Free Commercial Zone Administration (16-12-2014)
<b>L3</b>	<b>TP-077-3:2013</b> Perkhidmatan Dalam Penerbangan In-Flight Services (30-12-2013)	<b>TP-804-3:2014</b> Airport Landside, Terminal & Airside Operations (16-12-2014)	<b>TP-805-3:2014</b> Operasi Zon Komersial Bebas Free Commercial Zone Operations (16-12-2014)
<b>L2</b>	Tiada Tahap (No Level)		
<b>L1</b>			

**Table 2.10: Relevant Aerospace NOSS – Airport Operation & Maintenance**

	<b>Operasi &amp; Penyelenggaraan Lapangan Terbang (Airport Operation &amp; Maintenance)</b>



	( Aeronautical Ground Lighting)	(Baggage Handling System)	(Passenger Boarding Bridge)
L5	<b>TP-801-5:2014</b> Aeronautical Ground Lighting Operations & Maintenance Management (16-12-2014)	<b>TP-802-5:2014</b> Baggage Handling System Operation & Maintenance Management (16-12-2014)	<b>TP-803-5:2014</b> Passenger Boarding Bridge System Management (16-12-2014)
L4	<b>TP-801-4:2014</b> Aeronautical Ground Lighting Operations & Maintenance Administration (16-12-2014)	<b>TP-802-4:2014</b> Baggage Handling System Operation & Maintenance Administration (16-12-2014)	<b>TP-803-4:2014</b> Passenger Boarding Bridge System Management (16-12-2014)
L3	<b>TP-801-3:2013</b> Aeronautical Ground Lighting Maintenance (30-12-2013)	<b>TP-802-3:2013</b> Baggage Handling System Operation & Maintenance Services (30-12-2013)	<b>TP-803-3:2013</b> Passenger Boarding Bridge Operation & Maintenance Services (30-12-2013)
L2	Tiada Tahap (No Level)		
L1			

**Table 2.11: Relevant Aerospace NOSS – Ground and Ramp Services**

	Servis Tanjakan (Ramp Services)	Pengendalian Bumi (Ground Handling)	(Airport Rescue & Firefighting)
L5	Belum ada (Not Available)	Belum ada (Not Available)	<b>TP-079-5:2016</b> Pengurusan Operasi Penyelamatan Lapangan Terbang & Pemandaman Api Airport Rescue & Firefighting Operation Management (04-02-2016)
L4			<b>TP-079-4:2016</b> Kawalan Operasi Penyelamatan Lapangan Terbang & Pemandaman Api Airport Rescue & Firefighting Operation Control (04-02-2016)
L3	<b>TP-800-3:2011</b> Ground Handling-Ramp Services (18-11-11)	<b>TP-078-3:2013</b> Operasi Pengendalian Bumi Ground Handling Operation (30-12-2013)	<b>TP-079-3:2014</b> Operasi Penyelamatan Lapangan Terbang & Pemandaman Api Airport Rescue & Firefighting Operation (25-09-2014)
L2	<b>TP-800-2:2011</b> Ground Handling-Ramp Services (18-11-11)	Belum ada (Not Available)	Tiada Tahap (No Level)
L1	<b>TP-800-1:2011</b> Ground Handling-Ramp Services (18-11-11)	Belum ada (Not Available)	Tiada Tahap (No Level)

**Table 2.12: Relevant Aerospace National Competency Standard (NCS) – Penetrant Testing**

NCS	<b>Penetrant Testing (PT) – Aerospace Materials, Components and Structures</b>
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Area	
L5	Belum Ada (Not Available)
L4	Belum Ada (Not Available)
L3	<b>M712-003-3:2017</b> Penetrant Testing – Aerospace Materials, Components and Structures (13-06-2017)
L2	<b>M712-003-2:2017</b> Penetrant Testing – Aerospace Materials, Components and Structures (13-06-2017)
L1	<b>M712-003-1:2017</b> Penetrant Testing – Aerospace Materials, Components and Structures (13-06-2017)

### 2.5.3 SEGMENTATION OF THE AEROSPACE INDUSTRY

Preliminary literature review has identified that the Aerospace Industry in Malaysia is currently segmented into 5 different sub-sectors such as below (Please take note that further research from surveys and focus group discussions may result in various job areas identified):

#### a) Aero Manufacturing

Aero Manufacturing includes the production of equipment and vehicles for air and space travel. This sub-sector comprises of Engineering and Design, Aero-structure, Avionics, Engines and Airframe Equipment. <sup>13</sup>

#### b) System Integration

Systems Integration includes the development and testing of systems related to the Aerospace Industry, such as radio navigation, flight management and monitoring applications etc. Systems Integration comprises of Aircraft Avionics, Spacecraft, Unmanned Aerial Vehicles (UAV), Simulators, Ground Systems (ATC), Air Traffic Equipment (ATE), Missiles and Rockets. <sup>14</sup>

#### c) Engineering and Design Services

Engineering and Design Services include services pertaining to the design, development, testing, and production of aircraft and related systems (aeronautical engineering).<sup>15</sup> It may include Engineering Design, Structural Design, Tooling Design, Technical Services and Product Research and Development (R & D).

#### d) Maintenance, Repair and Overhaul (MRO)

Aircraft Maintenance, Repair and Overhaul (MRO) activities ensure that aircraft are maintained in pre-determined conditions of airworthiness. This sub-sector comprises of Engineering and Design, Aircraft – Commercial and General Aviation (Line, Heavy, Engines, Composite, Modifications), Aircraft – Military (Line, Heavy, Engines, Composite,

<sup>13</sup> Malaysian Aerospace Industry Blueprint 2030

<sup>14</sup> Malaysian Aerospace Industry Blueprint 2030

<sup>15</sup> <http://www.dictionary.com/browse/aerospace-engineering>



Modifications); Ground Systems (Air Traffic Control (ATC), Air Space Management, Air Defence Systems), Simulators and Ground Support Equipment. <sup>16</sup>

#### e) Education and Training

Education and training is imperative to ensure the Aerospace Industry workforce meet industry requirements in terms of skills, knowledge and attitude. The Education and Training sub-sector comprises of areas related to new entrants, either white collar or blue collar at Basic and Bridging levels, Apprenticeship, On Job Training, Continuing Professional Development and General Education. <sup>17</sup>

### 2.5.4 HUMAN CAPITAL DEVELOPMENT OF THE AEROSPACE INDUSTRY

In the year 2017, JPK has appointed NAICO as an Industry Lead Body (ILB) for the Aerospace Industry. As an ILB, NAICO is responsible for guiding the overall skills training development for the Aerospace Industry. This involves the development of the Occupational Framework (OF), National Occupational Skills Standard (NOSS) and certification by means of Accreditation via Prior Achievement (*Pengiktirafan Pencapaian Terdahulu* – PPT), which are all under the jurisdiction of JPK.

Constant industry engagement is a key element throughout the development of the aforesaid projects to ensure they are according to industry requirements. As practised by other countries, the role of the ILB is important to align between Technical and Vocational Education and Training (TVET) and industry demands in order to produce highly skilled workers.

Other efforts of Human Capital Development spearheaded by the Government are the Human Capital Council chaired by the YAB Prime Minister with the EPU as its secretariat. The Critical Skills Gap Working group which comprises of Talent Corp and ILMIA (under the Ministry of Human Resources) has set up the Critical Skills Monitoring Committee (CSC) to identify Critical Occupations in the Aerospace Industry. Figure 2.3 shows the different occupations that require skilled human capital development as identified in the Critical Occupations List 2016/2017 conducted by the Critical Skills Monitoring Committee (CSC).<sup>18</sup> Figure 2.4 shows the different areas for Skilled Human Capital Development which were identified by NAICO. These areas consist of Engineering Design, Manufacturing & Assembly, System Integration, MRO Services, Research & Technology and Management. The related occupations are listed under each area.

Nominated Critical Occupation	Job Titles in the Occupational Group
Aircraft Technicians	Aircraft Maintenance Technicians (Airframes), Aircraft Service Technicians
Aircraft Pilots and Related Professionals	Pilot
Application Programmers	Application Programmer

<sup>16</sup> Malaysian Aerospace Industry Blueprint 2030

<sup>17</sup> Malaysian Aerospace Industry Blueprint 2030

<sup>18</sup> TalentCorp. Critical Occupations List Report 2016/2017.

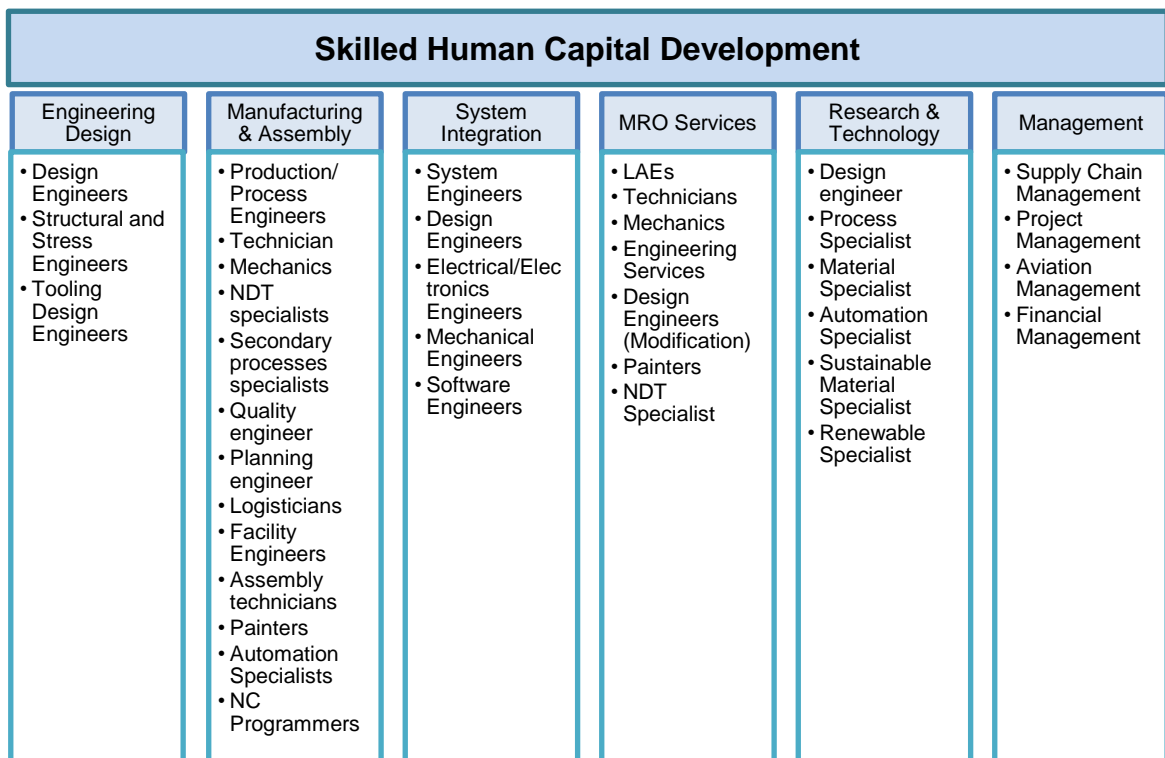




Engineering Professionals Not Elsewhere Classified	QA Engineer and Manager
Industrial and Production Engineers	NDT Technician and Manager
Manufacturing Professionals	Aero-Composite Procurement, Quality Controller Specialist
Manufacturing Supervisors	Manufacturing Lead
Mechanical Engineering Technicians	Aero technician, NC Programmer, CNC Technician
Ship Engineers	Licensed Aircraft Maintenance Engineer
Supply, Distribution and Related Managers	Supplier Development Engineer and Manager
Welders and Flame Cutters	Welder

**Figure 2.3: Aerospace Industry Critical Occupations as identified by the Critical Skills Monitoring Committee (CSC)**

*(Source: Critical Occupations List Report 2016/2017)*



**Figure 2.4: Aerospace Industry Sub-sectors as identified by NAICO**

*(Source: NAICO)*

## 2.6 CHAPTER CONCLUSION

The findings gathered from the literature review suggest that the Aerospace Industry must clearly define the human capital requirements. The preliminary findings show that there are skills and talent gaps in the industry. Further research and investigations are required to confirm them. The research methodology used for this study is elaborated in Chapter 3.

## CHAPTER 3: METHODOLOGY

### 3.1 CHAPTER INTRODUCTION



This chapter describes the methodology to be used in the occupational analysis process for the purpose of developing the Occupational Framework (OF) for the Aerospace Industry.

## 3.2 RESEARCH METHODOLOGY

In this study, qualitative analysis was selected as the main method of obtaining the necessary input in view of the setup of the Aerospace Industry and the types and sources of information required to develop the occupational framework. As qualitative research investigates not only the what, where and when, but also the why and how of the decision making process, smaller but more focused samples are used instead. It focuses on unique themes that illustrate the range of the meanings of the subject matter rather than the statistical significance of the occurrence. This process uses inductive reasoning, by which themes and categories emerge from the data through the researcher's careful examination and constant comparison.

This study uses a combination of these methods to gather information: analysis of documents, semi-structured interviews, participant observation, and discussion workshops.

Below is the development process of the OF for the Aerospace Industry:

### **Step 1: Information Gathering/ Literature Review**

In this process, books, scholarly articles, news and articles published by the government, regulatory and professional bodies and any other sources relevant to the background information of the industry, its current Aerospace and manpower requirements are surveyed and examined.

### **Step 2: Industry Engagement / Focus Group Meeting of Subject Matter Experts**

Facts obtained during the literature review were discussed and presented to the Subject Matter Experts, comprising representatives from the industry, during the focus group workshop sessions for their review and confirmation. The confirmed information was then included in Chapter 2 and used as the basis of the analysis process.

The scope of the study and analysis is centred on the following key areas:

- Industry background;
- Occupational structure and description; and
- Jobs and skills in demand.

The Subject Matter Experts together with the facilitator produced the draft survey questionnaire which seeks to elicit information on the key areas from the industry representatives through in-depth interviews.

### **Step 3: Validation of the Questionnaire by Review Panel**

The draft survey questionnaire was then reviewed and validated by the Review Panel comprising industry representatives who are not in the Development Panel. A sample of the validated survey questionnaire is included in this report in Annex 3.

### **Step 4: Survey – In-depth Interviews**



In-depth interview surveys were conducted with the industry. The survey respondents comprised of those from all job areas under the Aerospace Industry. These interviews aimed to obtain information on the common occupational structures used in various organisations, their job scopes, skills gap and emerging skills required.

#### **Step 5: Data Analysis**

The collated findings of the survey were then analysed and tabulated based on the most common responses received from the survey on the following items:

- Scope of the Industry and its sub-sectors;
- Occupational groups of each sub-sector;
- Occupational titles under each sub-sector;
- Occupational structure based on MOSQF Level;
- Occupational description; and
- Jobs and skills in demand.

#### **Step 6: Focus Group Meeting with Subject Matter Experts**

The analysed findings of the survey containing the information highlighted in Step 5 were then presented to the Subject Matter Experts for their review and confirmation. Thereafter, the Subject Matter Experts proceeded with the development of the Occupational Structure (OS) and Occupational Description (OD). The technique of OS development is described in section 3.2.1 while the OD development technique is explained in section 3.2.2 below. All the above information was presented as a draft OF document according to the format prescribed by JPK.

#### **Step 7: Review of the Final Draft OF Document by Review Panel**

The final draft of the OF Document was presented to the Review Panel in the Occupational Framework Technical Evaluation Committee meeting for their comments and approval before being submitted to JPK.

The details of the industry engagement sessions involving Industry Players, Subject Matter Experts and the Review Panel are as below:

**Table 3.1: List of Industry Engagement Sessions**



No.	Date	Venue	Activity
1	13 <sup>th</sup> – 14 <sup>th</sup> Sept. 2017	IBIS Styles Hotel, Kuala Lumpur	<ul style="list-style-type: none"> <li>• <b>1<sup>st</sup> Development Workshop</b></li> <li>• Brainstorming on industry scope and background</li> <li>• Review on Literature Review</li> <li>• Development of Survey Questionnaire</li> </ul>
2	25 <sup>th</sup> Sept. 2017	NAICO Office, Ministry of International Trade and Industry, Kuala Lumpur	<ul style="list-style-type: none"> <li>• <b>1<sup>st</sup> JTPOF Technical Evaluation Meeting</b></li> </ul>
3	5 <sup>th</sup> Oct. 2017	Saffron Room, Ministry of International Trade and Industry, Kuala Lumpur	<ul style="list-style-type: none"> <li>• Industry Engagement and survey questionnaire distribution</li> </ul>
4	9 <sup>th</sup> Oct. 2017	Astronautic Technology (M) Sdn. Bhd., Selangor	<ul style="list-style-type: none"> <li>• Industry Site Visit</li> </ul>
5		GE Engine Services Malaysia Sdn. Bhd., Selangor	<ul style="list-style-type: none"> <li>• Industry Site Visit</li> </ul>
6	12 <sup>th</sup> – 13 <sup>th</sup> Oct. 2017	Airbus Helicopters Malaysia Sdn. Bhd., Selangor	<ul style="list-style-type: none"> <li>• <b>2<sup>nd</sup> Development Workshop</b></li> <li>• Occupational Description development</li> <li>• Survey findings analysis (Skills in Demand, Jobs in Demand and Emerging Skills)</li> <li>• Industry Site Visit/On-site Observation</li> </ul>
7	20 <sup>th</sup> Oct. 2017	Sepang Aircraft Engineering Sdn. Bhd., Selangor	<ul style="list-style-type: none"> <li>• Industry Site Visit</li> </ul>
8	24 <sup>th</sup> Oct. 2017	Malaysian Industry-Government Group For High Technology (MIGHT). MIGHT Partnership Hub, Selangor	<ul style="list-style-type: none"> <li>• <b>2<sup>nd</sup> JTPOF Technical Evaluation Meeting</b></li> </ul>
8	26 <sup>th</sup> Oct. 2017	Aerospace Composites Malaysia Sdn. Bhd., Kedah	<ul style="list-style-type: none"> <li>• Industry Site Visit</li> </ul>
10	27 <sup>th</sup> Oct. 2017	Celestica Malaysia Sdn. Bhd., Kedah	<ul style="list-style-type: none"> <li>• Industry Site Visit</li> </ul>
11	3 <sup>rd</sup> Nov. 2017	CTRM Aero Composites Sdn. Bhd., Melaka	<ul style="list-style-type: none"> <li>• Industry Site Visit</li> </ul>
12	3 <sup>rd</sup> Nov. 2017	Imperial Heritage Hotel, Melaka	<ul style="list-style-type: none"> <li>• <b>3<sup>rd</sup> Development Workshop</b></li> </ul>
13	4 <sup>th</sup> Nov 2017	Imperial Heritage Hotel, Melaka	<ul style="list-style-type: none"> <li>• <b>3<sup>rd</sup> JTPOF Technical Evaluation Meeting and Handover of Occupational Framework document to JPK</b></li> </ul>

### 3.2.1 OCCUPATIONAL STRUCTURE (OS) DEVELOPMENT

The OS is developed based on the following processes:



#### **i. Identification of industry scope and boundaries with other relevant industries**

The identification of the industry scope is important so that when identifying the relevant sub-sectors and areas under the industry, it will define the segmentation of the particular industry. This will eliminate the possibility of duplication between common areas. The rule of thumb is to avoid duplicating the organisation chart as this will include other areas such as marketing, administration, human resources and public relations. These areas are common across various industries and have a different set of skill sets. Grouping and segmentation based on similar skill sets in terms of technical abilities that are unique to the particular industry is a determining factor. The MSIC and existing OS in the DSD NOSS Registry were also used as a point of reference.

#### **ii. Identification of sub-sector/area/sub-area**

The coverage of a sub-sector should be able to accommodate a number of areas and sub-areas where applicable. Sub-sectors are identified as being components of an industry and can be clustered in terms of classification, segmentation or process driven.

#### **iii. Identification of occupational titles**

In order to identify occupational titles, it is important to obtain consensus from Subject Matter Experts that the occupational title will be easily accepted by practitioners in the industry.

#### **iv. Identification of competency levelling**

Levelling of an occupational title is done based on the level of competency that the personnel are required to be deemed competent for a specific designation. The level descriptors in Annex 1 are used as reference when determining the different levels relevant to a specific occupational title.

### **3.2.2 OCCUPATIONAL DESCRIPTION (OD) DEVELOPMENT**

The OD is the general description of a particular job's main job scope. The OD is developed using a combination of brainstorming sessions with Subject Matter Experts and comparison of the OD to other available descriptors of the same job. Below are the main steps in producing an OD for the respective occupation titles:

- a) Determine the main areas and sub-areas in the sub-sector;
- b) Identify the occupational titles; and
- c) Identify the job scope.

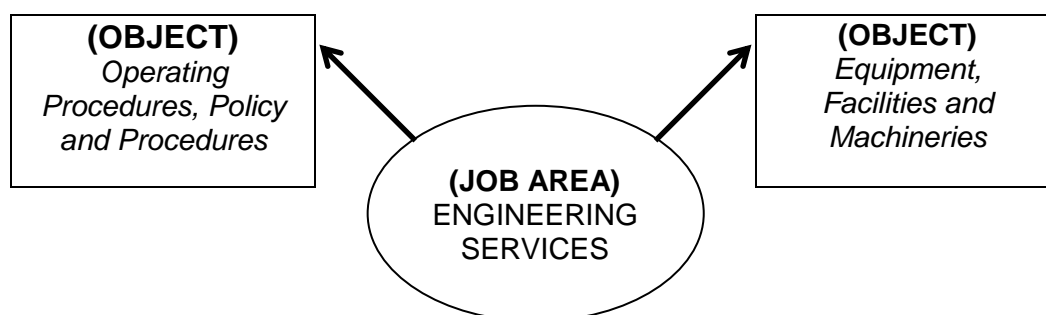
To describe the OD clearly, the statement must consist of a **Verb**, **Object** and **Qualifier**. The rationale of determining the descriptor attributes is to facilitate NOSS development especially in the job analysis and competency analysis.

#### **a) Object**

The object is determined first before the verb and qualifier as it is the main determinant that distinguishes one occupation from another. The objects are acquired from the industry experts during a brainstorming session and written on Development of Curriculum (DACUM)



cards so that all the experts can see the objects identified. Objects of those in the specified sub-sector or area are determined as in Figure 3.1 below:



**Figure 3.1: Example of Identifying Objects**

#### **b) Verb**

The verb is then determined based on the level of difficulty and competency of the identified job titles, such as below:

- ✓ **Object** : *engineering services*
- ✓ **Verb for Level 4** : **Perform**
- ✓ **Verb for Level 5** : **Coordinate**
- ✓ **Verb for Level 6** : **Manage**

Hence, the contents of the OD will be as below:

- Senior Manager (Level 6)
- ✓ **Manage** *engineering services + (qualifier)*
- Manager (Level 5)
- ✓ **Coordinate** *engineering services + (qualifier)*
- Executive (Level 4)
- ✓ **Perform** *engineering services + (qualifier)*

#### **c) Qualifier**

Based on the example above, the statement is not clear as there is no qualifier for the object, therefore a qualifier must be added to further clarify it. Below is an example:

- ✓ **Coordinate** *engineering services to achieve the expected quality of services provided to the organisation's customers*

### **3.3 CHAPTER CONCLUSION**

The methodology explained in this chapter has been applied throughout the development of the Occupational Framework for the Aerospace Industry. Cooperation and commitment from the industry players has played a major role in the success of implementing the focus group discussions, survey and industry visits. The findings of this study, which include, identifying and determining the Occupational Structure, development of Occupational Description, Jobs in Demand, Skills Gaps and Emerging Skills are presented in the next chapter, Chapter 4.



## CHAPTER 4: FINDINGS

### 4.1 CHAPTER INTRODUCTION

This chapter focuses on the analysis of the findings, both from the Focus Group and the industry survey carried out. The objective is to develop the Occupational Structure (OS), develop the Occupational Description (OD) and to analyse jobs in demand, skills in demand and recommendations suggested by the survey respondents and Focus Group panel members.

Based on the Focus Group discussions and survey interviews, six (6) sub-sectors of the Aerospace Industry have been identified as listed below:

- (a) Maintenance Repair Overhaul (MRO)
- (b) Aircraft Manufacturing
- (c) System Integration
- (d) Engineering & Design
- (e) Continuing Airworthiness Management Organisation (CAMO)
- (f) Aerospace Support Services

The Occupational Framework (OF) analysis is therefore focused on these 6 sub-sectors. The scope of the analysis is on 3 key areas, i.e. (a) the Occupational Structure (OS), (b) the Occupational Description (OD), and (c) jobs and skills in demand. This chapter therefore highlights the findings gathered on these key areas. The findings which include the OS, OD and skills in demand are elaborated below.

### 4.2 OCCUPATIONAL STRUCTURE (OS)

The OS depicts the various job areas of the industry arranged based on the common competencies. Occupational and functional areas which require similar competencies regardless of industries, e.g. human resources, accounts & finance and information technology are not included. Only jobs and functional areas which are specific and unique to the Aerospace Industry are included in the OS. Therefore, the OS should not be confused with an organisational chart.

It must be noted that there are certain sub-areas under the job area of Aircraft Maintenance Structure Engineering (under the sub-sector of MRO), that are common to other industries that apply the areas of engineering stated. These sub-areas are Aircraft Welding which may be referred to the Occupational Framework developed for the Welding and Fabrication industry and the Non Destructive Testing (NDT) sub-area which can be referred to the Occupational Structure developed for the NDT industry. The sub-area of Electrical personnel under Avionics Components Support Shop of the MRO sub-sector can be referred to the Electrical Industry Occupational Structure developed in line with Energy Commission requirements.



### 4.3 OCCUPATIONAL STRUCTURE (OS) COMPETENCY LEVELS

Six sub-sectors have been identified as the main job areas under the Aerospace Industry. Each sub-sector has defined the levels of competency based on the definition of the Malaysian Occupational Skills Qualification Framework and the industry's entry level requirements. The OS can be seen in Table 4.2 till Table 4.15 in this section of the report.

The Maintenance Repair Overhaul (MRO) sub-sector generally has entry levels at Level 1 as a mechanic for all the respective job areas under MRO. However there are jobs under areas such as Flight Simulator and Aircraft Components Remanufacturing that generally starts at level 2 as technicians/operators, Aircraft Design Conversion starts as a drafter at level 3 and the Air Traffic System job area which starts at level 2 as technicians. The highest level of competency in MRO is at level 7 as Specialists or Managers, where they are responsible to oversee their respective areas of MRO activities in terms of quality, specifications and safety.

The entry level for the Aircraft Manufacturing sub-sector is at level 1 as Production Assistants/Assistant Technician for the Aircraft Production job area, where the highest competency is as the Production Manager or Specialists for each sub-area. Under the Aircraft Manufacturing Quality Assurance, QA and NDT job area, the entry level is at level 2 as a Technician for NDT and Quality Inspector at level 2 under QA and Quality Inspection. For the NDT and Inspection sub-area, the highest level of competency is as an engineer at level 6. Under the Aircraft Engineering job areas, the Tooling sub-area starts at level 2 as a Tooling Technician and for the sub-area of CAD/CAM start at a higher level of competency as a CAD/CAM Engineer which is at level 5. This also applies for the Process Control sub-area which starts at level 5 as a Process Control Engineer.

The System Integration sub-sector's entry level is at level 4 as Assistant Engineer. This is due to the high level of competency required when dealing with systems and networks covering skills such as programming, system analysis, network & system architecture and network safety. The highest level of competency is as Specialists at level 7 and Chief Engineer for Spacecraft Systems Engineering.

The Engineering & Design sub-sector has an entry level at level 5 as Technologists/Engineers as they require a high level of competency in terms of planning and design for engineering design, structural design and tooling design. The highest competency is at level 7 as a Principal Technologist/Principal Engineer. The same applies for job areas under Technical Services and Product R&D.

The Continuing Airworthiness Management Organisation (CAMO) entry level is at level 3 as assistants who may progress as assistant engineers at level 4 and engineers at level 5, where at level 6 till 8 they will be competent as specialists.





For the Aerospace Support Services sub-sector, the entry level for Technical Support Services and Supply Chain Management is at level 5 as an engineer where they may progress to levels 6,7 and finally as Principal Specialist at level 8. The personnel under Ground Handling start at level 3 as Ground Handling Assistants. The Quality Management area starts at level 4 as an Assistant Engineer and the highest is as a Specialist. The Spacecraft Logistics and Launch area starts at level 1 as an Assistant Technician and the highest level is at level 7 as a Manager. The Cabin Crew area starts at level 2 as Cabin Crew and the highest is as an In-Flight Supervisor at level 4. The General Aviation Flight Crew area for Rotary and Fixed Wing starts at level 3 as a Second Officer. The highest level is at level 8 as a Flight Safety Trainer.

Table 4.1 below shows the summary of job titles for the Aerospace Industry. The total of job titles identified is 483 for all the 6 sub-sectors. The highest number of job titles is under the Maintenance Repair Overhaul (MRO) sub-sector with 279 job titles. This is due to the breakdown of jobs according to the many sections of the aircraft and the different types of MRO work, where the bulk of the job titles are under the Aircraft Maintenance area with 211 job titles.

Tables 4.2 till 4.15 show the visual representations of the Occupational Structure (OS) for all 6 sub-sectors under the Aerospace Industry. The OS show the MSIC Sections, MSIC Divisions and MSIC Groups that the sub-sectors fall under. It also depicts the job titles and their related levels of competency. Please note that for Table 4.2 to 4.15, job titles marked with (\*) are considered as critical job titles.



**Table 4.1 Summary of Job Titles for the Aerospace Industry**

No	SUB-SECTOR	AREA	LEVEL								No. of Job Titles Identified According to Job Area	No. of Job Titles Identified According to Sub-sector
			1	2	3	4	5	6	7	8		
1	Maintenance Repair Overhaul (MRO)	Aircraft Maintenance	29	30	31	31	30	30	30	0	211	279
		Aircraft Upgrade & Modification	3	5	6	6	6	6	6	0	38	
		Air Traffic System	0	5	5	5	5	5	5	0	30	
2	Manufacturing	Production	6	6	6	6	6	6	6	0	42	70
		Quality	0	3	3	3	3	3	1	0	16	
		Engineering	0	1	1	1	3	3	3	0	12	
3	System Integration	System Programming (SP)	0	0	0	1	1	1	1	0	4	25
		System Analysis (SA)	0	0	0	1	1	1	1	0	4	
		Network Architecture (NA)	0	0	0	1	1	1	1	0	4	
		Network Safety (NS)	0	0	0	1	1	1	1	0	4	
		System Architecture (SAr)	0	0	0	1	1	1	1	0	4	
		Spacecraft Systems Engineering	0	0	0	1	1	1	1	1	5	
4	Engineering & Design	Engineering Design	0	0	0	1	2	2	2	0	7	44
		Structural Engineering	0	0	0	0	2	2	2	0	6	
		Tooling Design	0	0	0	1	1	1	1	0	4	
		Technical Services	0	0	0	0	6	6	6	0	18	
		Product R&D	0	0	0	0	3	3	3	0	9	



No	SUB-SECTOR	AREA	LEVEL								No. of Job Titles Identified According to Job Area	No. of Job Titles Identified According to Sub-sector	
			1	2	3	4	5	6	7	8			
5	Continuing Airworthiness Management Organisation (CAMO)	Engineering Services (ES)	0	0	1	1	1	1	1	1	1	6	25
		Quality	0	0	1	1	1	1	1	1	1	6	
		Planning	0	0	1	1	1	1	1	1	1	6	
		Technical Publication & Record	0	0	1	1	1	1	1	1	1	6	
		Airworthiness Review Staff (ARS)	0	0	0	0	0	1	0	0	0	1	
6	Aerospace Support Services	Technical Support Services	0	0	0	0	1	1	1	1	1	4	40
		Ground Handling	0	0	1	1	1	1	1	1	1	6	
		Supply Chain Management (SCM)	0	0	0	0	1	1	1	1	1	4	
		Quality Management	0	0	0	0	1	1	1	1	1	4	
		Spacecraft Logistics & Launch	1	1	1	1	1	1	1	1	0	7	
		Cabin Crew	0	1	1	1	0	0	0	0	0	3	
		Flight Crew (General Aviation)	0	0	2	2	2	2	2	2	2	12	
<b>Total No. of Job Titles identified according to Levels</b>			<b>39</b>	<b>52</b>	<b>61</b>	<b>69</b>	<b>84</b>	<b>85</b>	<b>82</b>	<b>11</b>	<b>483</b>		



**Table 4.2: Rotary Wing and Fixed Wing Sub-area of Aircraft Maintenance Job Area (Sub Sector: Maintenance Repair Overhaul (MRO))**

<b>MSIC Section</b>	<b>C - Manufacturing</b>			
<b>MSIC Division</b>	<b>33 - Repair And Installation Of Machinery And Equipment</b>			
<b>MSIC Group (Sub Sector)</b>	<b>331 - Repair Of Fabricated Metal Products, Machinery And Equipment (Maintenance Repair Overhaul - MRO)</b>			
<b>Job Area Level</b>	<b>Aircraft Maintenance (Mechanical – Rotary Wing)</b>	<b>Aircraft Maintenance (Avionics – Rotary Wing)</b>	<b>Aircraft Maintenance (Mechanical – Fixed Wing)</b>	<b>Aircraft Maintenance (Avionics- Fixed Wing)</b>
<b>8</b>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
<b>7</b>	Aircraft Maintenance Manager	Avionics Manager*	Aircraft Maintenance Manager	Avionics Manager*
<b>6</b>	Foreman Licensed Aircraft Engineer (CAT C)	Avionics Foreman* (CAT C)	Foreman Licensed Aircraft Engineer - (CAT C)	Avionics Foreman* (CAT C)
<b>5</b>	B1 Licensed Aircraft Engineer (Type Rated-TR)	B2 Licensed Aircraft Engineer (Type Rated-TR)*	B1 Licensed Aircraft Engineer (Type Rated-TR)	B2 Licensed Aircraft Engineer (Type Rated-TR)*
<b>4</b>	B1 Licensed Aircraft Engineer (Non-Type Rated - NTR)	B2 Licensed Aircraft Engineer (Non-Type Rated - NTR)	B1 Licensed Aircraft Engineer (Non-Type Rated - NTR)	B2 Licensed Aircraft Engineer (Non-Type Rated - NTR)
<b>3</b>	Licensed Aircraft Maintenance Technician (CAT A)	Avionics Supervisor	Licensed Aircraft Maintenance Technician (CAT A)	Avionics Supervisor
<b>2</b>	Aircraft Maintenance Technician (Non-licensed)	Avionics Maintenance Technician	Aircraft Maintenance Technician (Non-licensed)	Avionics Maintenance Technician
<b>1</b>	Aircraft Mechanic	Avionics Mechanic	Aircraft Mechanic	Avionics Mechanic



**Table 4.3: Aircraft Maintenance Structure Engineering sub-area of the Aircraft Maintenance Structure Engineering Job Area (Sub Sector: Maintenance Repair Overhaul (MRO))**

MSIC Section		C – Manufacturing						
MSIC Division		33 - Repair And Installation Of Machinery And Equipment						
MSIC Group (Sub Sector)		331 - Repair Of Fabricated Metal Products, Machinery And Equipment (Maintenance Repair Overhaul - MRO)						
Job Area	Aircraft Maintenance Structure Engineering (Sheet Metal)	Aircraft Maintenance Structure Engineering (Aircraft Interior Equipment Workshop)	Aircraft Maintenance Structure Engineering (Flight Control Balancing)	Aircraft Maintenance Structure Engineering (Composite)	Aircraft Maintenance Structure Engineering (Non Destructive Testing)	Aircraft Maintenance Structure Engineering (Aircraft Painting)	Aircraft Maintenance Structure Engineering (Aircraft Welding)	Aircraft Maintenance Structure Engineering (Technical Services)
Level								
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	No Level	Aircraft Interior Equipment Manager	Flight Control Manager	Composite Principal Specialist	NDT Manager	Painting Manager	Welding Manager	Technical Services Manager
6	No Level	Aircraft Interior Equipment Foreman	Flight Control Foreman	Composite Specialist*	NDT Asst. Manager	Painting Foreman	Welding Foreman	Technical Services Foreman
5	No Level	Aircraft Interior Equipment Engineer	Flight Control Balancing Engineer	Composite Engineer*	NDT Engineer	Painting Engineer	Welding Engineer	Senior Technical Services Engineer
4	Sheet Metal Lead*	Asst. Aircraft Interior Equipment Engineer/ Certifying Technician	Asst. Flight Control Balancing Engineer	Asst. Composite Engineer	NDT Technician (Level III)*	Painting Inspector	Assistant Welding Engineer /Welding Inspector	Asst. Technical Services Engineer
3	Sheet Metal Supervisor	Aircraft Interior Equipment Supervisor	Flight Control Balancing Supervisor	Composite Technician*	NDT Technician (Level II)*	Painting Supervisor	Senior Welding Technician /Welding Supervisor	Technical Services Officer
2	Sheet Metal Technician*	Aircraft Interior Equipment Technician	Flight Control Balancing Technician	Assistant Composite Technician	NDT Technician (Level I)*	Painting Technician*	Welding Technician	No Level
1	Sheet Metal Mechanic	Aircraft Interior Equipment Mechanic	Flight Control Balancing Mechanic	Composite Mechanic	NDT Assistant	Painting Assistant	Welding Assistant	No Level



**Table 4.4: Avionic Components Support Shop Sub-Area of the Aircraft Maintenance Job Area (Sub Sector: MRO)**

<b>MSIC Section</b>	<b>C - Manufacturing</b>						
<b>MSIC Division</b>	<b>33 - Repair And Installation Of Machinery And Equipment</b>						
<b>MSIC Group (Sub Sector)</b>	<b>331 - Repair Of Fabricated Metal Products, Machinery And Equipment (Maintenance Repair Overhaul - MRO)</b>						
<b>Job Area Level</b>	<b>Avionic Components Support Shop (Electrical)</b>	<b>Avionic Components Support Shop (Electronic)</b>	<b>Avionic Components Support Shop (Instrument)</b>	<b>Avionic Components Support Shop (Auto Pilot)</b>	<b>Avionic Components Support Shop (Navigation)</b>	<b>Avionic Components Support Shop (Radar)</b>	<b>Avionic Components Support Shop (Radio)</b>
<b>8</b>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
<b>7</b>	Electrical Specialist	Electronic Specialist	Instrument Specialist	Auto Pilot Specialist	Navigation Specialist	Radar Specialist	Radio Specialist
<b>6</b>	Electrical Asst. Specialist	Electronic Asst. Specialist	Instrument Asst. Specialist	Auto Pilot Asst. Specialist	Navigation Asst. Specialist	Radar Asst. Specialist	Radio Asst. Specialist
<b>5</b>	Electrical Engineer	Electronic Engineer	Instrument Engineer	Auto Pilot Engineer	Navigation Engineer	Radar Engineer	Radio Engineer
<b>4</b>	Electrical Asst. Engineer	Electronic Asst. Engineer	Instrument Asst. Engineer	Auto Pilot Asst. Engineer	Navigation Asst. Engineer	Radar Asst. Engineer	Radio Asst. Engineer
<b>3</b>	Electrical Supervisor	Electronic Supervisor	Instrument Supervisor	Auto Pilot Supervisor	Navigation Supervisor	Radar Supervisor	Radio Supervisor
<b>2</b>	Electrical Technician	Electronic Technician	Instrument Technician	Auto Pilot Technician	Navigation Technician	Radar Technician	Radio Technician
<b>1</b>	Electrical Mechanic	Electronic Mechanic	Instrument Mechanic	Auto Pilot Mechanic	Navigation Mechanic	Radar Mechanic	Radio Mechanic



**Table 4.5: Equipment Calibration and Flight Simulator Calibration Sub-area of the Aircraft Maintenance Job Area  
(Sub Sector: MRO)**

<b>MSIC Section</b>	<b>C - Manufacturing</b>	
<b>MSIC Division</b>	<b>33 - Repair And Installation Of Machinery And Equipment</b>	
<b>MSIC Group (Sub Sector)</b>	<b>331 - Repair Of Fabricated Metal Products, Machinery And Equipment (Maintenance Repair Overhaul - MRO)</b>	
<b>Level \ Job Area</b>	<b>Aircraft Maintenance (Equipment Calibration)</b>	<b>Aircraft Maintenance (Flight Simulator)</b>
<b>8</b>	<i>No Level</i>	<i>No Level</i>
<b>7</b>	Calibration Testing Analysis Specialist	Flight Simulator Specialist
<b>6</b>	Calibration Testing Analysis Asst. Specialist	Flight Simulator Designer
<b>5</b>	Calibration Testing Analysis Engineer	Flight Simulator Engineer
<b>4</b>	Calibration Testing Analysis Asst. Engineer	Flight Simulator Asst. Engineer
<b>3</b>	Calibration Testing Analysis Supervisor	Flight Simulator Supervisor
<b>2</b>	Calibration Testing Technician	Flight Simulator Technician
<b>1</b>	Calibration Testing Mechanic	<i>No Level</i>



**Table 4.6: Mechanical Components Support Shop Sub-area of the Aircraft Maintenance Job Area (Sub Sector: MRO)**

MSIC Section	C - Manufacturing									
MSIC Division	33 - Repair And Installation Of Machinery And Equipment									
MSIC Group (Sub Sector)	331 - Repair Of Fabricated Metal Products, Machinery And Equipment (Maintenance Repair Overhaul - MRO)									
Job Area	Mechanical Components Support Shop (Cabin Interior Equipment)	Mechanical Components Support Shop (Hydraulic)	Mechanical Components Support Shop (Oxygen)	Mechanical Components Support Shop (Pneumatic)	Mechanical Components Support Shop (Aircraft Components)	Mechanical Components Support Shop (Air-Conditioning)	Mechanical Components Support Shop (Landing Gear)	Mechanical Components Support Shop (Electroplating)	Mechanical Components Support Shop (Fuel Tank)	Mechanical Components Support Shop (Engine Bay - Turbine/Piston)
Level										
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	Cabin Interior & Upholstery Specialist	Hydraulic Specialist	Oxygen Specialist	Pneumatic Specialist	Aircraft Components Specialist	Air-Conditioning Specialist	Landing Gear Specialist	Electroplating Specialist	Fuel Tank Specialist	Engine Specialist
6	Cabin Interior & Upholstery Asst. Specialist	Hydraulic Asst. Specialist	Oxygen Asst. Specialist	Pneumatic Asst. Specialist	Aircraft Components Asst. Specialist	Air-Conditioning Asst. Specialist	Landing Gear Asst. Specialist	Electroplating Asst. Specialist	Fuel Tank Asst. Specialist	Engine Asst. Specialist
5	Cabin Interior & Upholstery Engineer	Hydraulic Engineer	Oxygen Engineer	Pneumatic Engineer	Aircraft Components Engineer	Air-Conditioning Engineer	Landing Gear Engineer	Electroplating Engineer	Fuel Tank Engineer	Engine Analysis and Testing Engineer
4	Cabin Interior & Upholstery Asst. Engineer	Hydraulic Asst. Engineer	Oxygen Asst. Engineer	Pneumatic Asst. Engineer	Aircraft Components Asst. Engineer	Air-Conditioning Asst. Engineer	Landing Gear Asst. Engineer	Electroplating Asst. Engineer	Fuel Tank Asst. Engineer	Engine Overhaul Asst. Engineer
3	Cabin Interior & Upholstery Supervisor	Hydraulic Supervisor	Oxygen Supervisor	Pneumatic Supervisor	Aircraft Components Supervisor	Air-Conditioning Supervisor	Landing Gear Supervisor	Electroplating Supervisor	Fuel Tank Supervisor	Engine Supervisor
2	Cabin Interior & Upholstery Technician	Hydraulic Technician	Oxygen Technician	Pneumatic Technician	Aircraft Components Technician	Air-Conditioning Technician	Landing Gear Technician	Electroplating Technician	Fuel Tank Technician	Engine Technician
1	Cabin Interior & Upholstery Mechanic	Hydraulic Mechanic	Oxygen Mechanic	Pneumatic Mechanic	Aircraft Components Mechanic	Air-Conditioning Mechanic	Landing Gear Mechanic	Electroplating Mechanic	Fuel Tank Mechanic	Engine Mechanic





**Table 4.7: Aircraft Structure Modification, Conversion and Components Remanufacturing Job Areas (Sub Sector: MRO)**

<b>MSIC Section</b>	<b>C – Manufacturing</b>				
<b>MSIC Division</b>	<b>33 - Repair And Installation Of Machinery And Equipment</b>				
<b>MSIC Group (Sub Sector)</b>	<b>331 - Repair Of Fabricated Metal Products, Machinery And Equipment (Maintenance Repair Overhaul - MRO)</b>				
<b>Job Area Level</b>	<b>Aircraft Structure Modification (Metal/Composite)</b>	<b>Aircraft Design Conversion</b>	<b>Aircraft Assembly Conversion</b>	<b>Aircraft Machining Conversion</b>	<b>Aircraft Components Remanufacturing</b>
<b>8</b>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
<b>7</b>	Aircraft Structure Specialist	Designer Analysis Specialist	Assembler Specialist	Machinist Specialist	Components Remanufacturing Specialist
<b>6</b>	Aircraft Structure Asst. Specialist*	Designer Analysis Asst. Specialist	Assembler Asst. Specialist	Machinist Asst. Specialist	Components Remanufacturing Asst. Specialist
<b>5</b>	Aircraft Structure Engineer	Designer Analysis and Testing Engineer	Assembler Engineer	Machinist Engineer	Components Remanufacturing Engineer
<b>4</b>	Aircraft Structure Asst. Engineer	Testing Designer	Assembler Tester	Machinist Asst. Engineer	Components Remanufacturing Asst. Engineer
<b>3</b>	Aircraft Structure Supervisor	Drafter	Assembler Supervisor	Machinist Senior Technician	Components Remanufacturing Senior Technician
<b>2</b>	Aircraft Structure Technician	<i>No Level</i>	Assembler Operator	Machinist	Components Remanufacturing Operator
<b>1</b>	Aircraft Structure Mechanic	<i>No Level</i>	Assembler	Machinist Operator	<i>No Level</i>



**Table 4.8: Air Traffic System Job Area (Sub Sector: MRO)**

Section	C - Manufacturing				
Division	33 - Repair And Installation Of Machinery And Equipment				
MSIC Group (Sub Sector)	331 - Repair Of Fabricated Metal Products, Machinery And Equipment (Maintenance Repair Overhaul - MRO)				
Job Area Level	MRO Air Traffic Communication System	MRO Air Traffic Navigation System	MRO Air Traffic Surveillance System	MRO Air Traffic Management	MRO Air Traffic System (Depot Repairing)
8	No Level	No Level	No Level	No Level	No Level
7	Communication Specialist	Navigation Specialist	Surveillance Specialist	Air Traffic Management Specialist	Depot Repairing Specialist
6	Assistant Communication Specialist	Assistant Navigation Specialist	Assistant Surveillance Specialist	Assistant Air Traffic Management Specialist	Assistant Depot Repairing Specialist
5	Communication Maintenance Engineer	Navigation Maintenance Engineer	Surveillance Maintenance Engineer	Air Traffic Management Maintenance Engineer	Depot Repairing Maintenance Engineer
4	Assistant Communication Maintenance Engineer*	Assistant Navigation Maintenance Engineer*	Assistant Surveillance Maintenance Engineer*	Assistant Air Traffic Management Maintenance Engineer*	Assistant Depot Repairing Maintenance Engineer
3	Senior Communication Technician	Senior Navigation Technician	Senior Surveillance Technician	Senior Air Traffic Management Technician	Senior Depot Repairing Technician
2	Communication Technician	Navigation Technician	Surveillance Technician	Air Traffic Management Technician	Depot Repairing Technician
1	No Level	No Level	No Level	No Level	No Level



**Table 4.9: Production Job Area (Sub Sector: Aircraft Manufacturing)**

MSIC Section	C - Manufacturing					
MSIC Division	28 - Manufacture Of Machinery And Equipment N.E.C.					
MSIC Group (Sub Sector)	282 - Manufacture Of Special-Purpose Machinery (Aircraft Manufacturing)					
Job Area Level	Aircraft Production (Welding)	Aircraft Production (Machining)	Aircraft Production (Laminating/Plating)	Aircraft Production Planning	Aircraft Production Assembly	Spacecraft Mechanical & Electronics Assembly, Integration & Testing (AIT)
8	No Level	No Level	No Level	No Level	No Level	No Level
7	No Level	Machining Specialist	Laminating/ Plating Manager	Planning Manager	Production Manager	AIT Manager
6	No Level	Assistant Machining Specialist	Assistant Laminating/ Plating Manager	Assistant Planning Manager	Assistant Production Manager	Assistant AIT Manager
5	Welding Engineer*	Machining Engineer	Laminating/ Plating Engineer	Planning Engineer	Production Engineer	AIT Engineer
4	Assistant Welding Engineer *	Assistant Machining Engineer	Assistant Laminating/ Plating Engineer	Assistant Planning Engineer	Assistant Production Engineer	Assistant AIT Engineer
3	Senior Welding Technician*	Senior Machinist	Senior Laminating/ Plating Technician	Senior Planning Technician	Senior Assembly Technician*	Senior AIT Technician
2	Welding Technician*	Machinist*	Laminating/ Plating Technician	Planning Technician	Assembly Technician*	AIT Technician
1	Production Assistant	Production Assistant	Production Assistant	Production Assistant	Production Assistant*	Assistant AIT Technician



**Table 4.10: Quality and Engineering Job Area (Sub Sector: Aircraft Manufacturing)**

MSIC Section	C - Manufacturing					
MSIC Division	28 - Manufacture Of Machinery And Equipment N.E.C.					
MSIC Group (Sub Sector)	282 - Manufacture Of Special-Purpose Machinery (Aircraft Manufacturing)					
Job Area Level	Aircraft Manufacturing Quality Assurance (QA)	Aircraft Manufacturing Quality Inspection	Aircraft Manufacturing NDT	Aircraft Engineering (Tooling)	Aircraft Engineering (CAD/CAM)	Aircraft Engineering (Process Control)
8	No Level	No Level	No Level	No Level	No Level	No Level
7	QA Specialist	No Level	No Level	Tool & Design Specialist	CAD/CAM Specialist	Process Control Specialist
6	Assistant QA Specialist	Senior Quality Inspection Engineer	NDT Technician (Level III)	Assistant Tool & Design Specialist	Assistant CAD/CAM Specialist	Assistant Process Control Specialist
5	QA Engineer	Quality Inspection Engineer	NDT Lead Technician (Level II)	Tool & Design Engineer	CAD/CAM Engineer	Process Control Engineer
4	Quality Inspection Assistant Engineer	Quality Inspection Assistant Engineer	NDT Senior Technician (Level II)	Assistant Tool & Design Technologist	No Level	No Level
3	Senior Quality Inspector	Senior Quality Inspector	NDT Technician (Level II)	Senior Tooling Technician	No Level	No Level
2	Quality Inspector	Quality Inspector	NDT Technician (Level I)	Tooling Technician	No Level	No Level
1	No Level	No Level	No Level	No Level	No Level	No Level



**Table 4.11: System Integration Sub Sector**

MSIC Section	M - Professional, Scientific And Technical Activities					
MSIC Division	71 - Technical Testing And Analysis					
MSIC Group (Sub Sector)	711 - Architectural And Engineering Activities And Related Technical Consultancy (System Integration)					
Job Area Level	Aerospace System Integration (System Programming)	Aerospace System Integration (System Analysis)	Aerospace System Integration (Network Architecture)	Aerospace System Integration (Network Safety)	Aerospace System Integration (System Architecture)	Aerospace System Integration (Spacecraft Systems Engineering)
8	No Level	No Level	No Level	No Level	No Level	Chief Engineer
7	SP Specialist	SA Specialist	NA Specialist	NS Specialist	SAr Specialist	Principal Engineer
6	Assistant SP Specialist	Assistant SA Specialist	Assistant NA Specialist	Assistant NS Specialist	Assistant SAr Specialist	Senior Engineer
5	SP Engineer	SA Engineer	NA Engineer	NS Engineer	SAr Engineer	Engineer
4	Assistant SP Engineer	Assistant SA Engineer	Assistant NA Engineer	Assistant NS Engineer	Assistant SAr Engineer	Assistant Engineer
3	No Level	No Level	No Level	No Level	No Level	No Level
2	No Level	No Level	No Level	No Level	No Level	No Level
1	No Level	No Level	No Level	No Level	No Level	No Level



**Table 4.12: Engineering Design, Structural Engineering and Tooling Design Job Area (Sub Sector: Engineering & Design)**

MSIC Section	M - Professional, Scientific And Technical Activities				
MSIC Division	71 - Technical Testing And Analysis				
MSIC Group (Sub Sector)	712 - Technical Testing And Analysis (Engineering & Design)				
Level \ Job Area	Engineering Design (Product Configuration)	Engineering Design (Design)	Structural Engineering Stress (Metallic and Composite)	Structural Engineering Fatigue & Damaged Tolerance (F&DT)	Tooling Design (Metallic and Composite)
8	No Level	No Level	No Level	No Level	No Level
7	Principal Product Configuration Engineer	Principal Design Engineer	Principal Stress Engineer	Principal F&DT Engineer	Principal Tooling Engineer
6	Senior Product Configuration Engineer	Senior Design Engineer	Senior Stress Engineer	Senior F&DT Engineer	Senior Tooling Engineer
5	Product Configuration Engineer	Design Engineer*	Stress Engineer	F&DT Engineer	Tooling Engineer
4	No Level	Aero Components Drafter	No Level	No Level	Tooling Drafter
3	No Level	No Level	No Level	No Level	No Level
2	No Level	No Level	No Level	No Level	No Level
1	No Level	No Level	No Level	No Level	No Level



**Table 4.13: Technical Services and Product R&D Job Area (Sub Sector: Engineering & Design)**

MSIC Section	M - Professional, Scientific And Technical Activities								
MSIC Division	71 - Technical Testing And Analysis								
MSIC Group (Sub Sector)	712 - Technical Testing And Analysis (Engineering & Design)								
Job Area Level	Technical Services (Compliance)	Technical Services (Electrical Services)	Technical Services (Structure Services)	Technical Services (Power Plant)	Technical Services (Avionics)	Technical Services (Reliability & Aircraft Performance)	Product R&D (Structural Improvement)	Product R&D (Process Improvement)	Product R&D (Product Improvement)
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	Principal Compliance Technologist	Principal Electrical Services Technologist	Principal Structure Services Technologist	Principal Power Plant Technologist	Principal Avionics Technologist	Reliability & Aircraft Performance Technologist	Principal Structural Improvement Technologist	Process Structural Improvement Technologist	Process Product Improvement Technologist
6	Senior Compliance Engineer	Senior Electrical Services Engineer	Senior Structure Services Engineer	Senior Power Plant Engineer	Senior Avionics Engineer	Senior Reliability & Aircraft Performance Engineer	Senior Structural Improvement Engineer	Senior Process Improvement Engineer	Senior Product Improvement Engineer
5	Compliance Engineer	Electrical Services Engineer	Structure Services Engineer	Power Plant Engineer	Avionics Engineer	Reliability & Aircraft Performance Engineer	Structural Improvement Engineer	Process Improvement Engineer	Product Improvement Engineer
4	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
3	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
2	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
1	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level



**Table 4.14: Continuing Airworthiness Management Organisation (CAMO) Sub Sector**

<b>MSIC Section</b>	<b>M - Professional, Scientific And Technical Activities</b>				
<b>MSIC Division</b>	<b>71 - Technical Testing And Analysis</b>				
<b>MSIC Group (Sub Sector)</b>	<b>712 - Technical Testing And Analysis (Continuing Airworthiness Management Organisation - CAMO)</b>				
<b>Job Area Level</b>	<b>CAMO Engineering Services (ES)</b>	<b>CAMO Quality</b>	<b>CAMO Planning</b>	<b>CAMO Technical Publication &amp; Record</b>	<b>CAMO Airworthiness Review Staff (ARS)</b>
<b>8</b>	Principal ES Specialist	Principal Quality Specialist	Principal Planning Specialist	Principal Technical Publication & Record Specialist	<i>No Level</i>
<b>7</b>	ES Specialist	Quality Specialist	Planning Specialist	Technical Publication & Record Specialist	<i>No Level</i>
<b>6</b>	Assistant ES Specialist	Assistant Quality Specialist	Assistant Planning Specialist	Assistant Technical Publication & Record Specialist	ARS Specialist*
<b>5</b>	ES Engineer*	Quality Engineer	Planning Engineer	Technical Publication & Record Engineer	<i>No Level</i>
<b>4</b>	Assistant ES Engineer	Assistant Quality Engineer	Assistant Planning Engineer	Assistant Technical Publication & Record Engineer	<i>No Level</i>
<b>3</b>	ES Assistant	Quality Assistant	Planning Assistant	Technical Publication & Record Assistant	<i>No Level</i>
<b>2</b>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
<b>1</b>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>





**Table 4.15: Aerospace Support Services Sub-Sector**

MSIC Section	H - Transportation & Storage							
MSIC Division	51 - Air Transport							
MSIC Group (Sub Sector)	511 - Passenger Air Transport & 512 – Freight Air Transport (Aerospace Support Services)							
Job Area Level	Aerospace Support Services (Technical Support Services)	Aerospace Support Services (Ground Handling)	Aerospace Support Services (Supply Chain Management)	Aerospace Support Services Quality Management	Aerospace Support Services (Spacecraft Logistics & Launch)	Aerospace Support Services (Cabin Crew)	Aerospace Support Services (General Aviation Flight Crew – Rotary Wing)	Aerospace Support Services (General Aviation Flight Crew – Fixed Wing)
8	Principal Technical Support Services Specialist	Principal Ground Handling Specialist	Principal SCM Specialist	No Level	No Level	No Level	Flight Safety Trainer	Flight Safety Trainer
7	Technical Support Services Specialist	Ground Handling Manager	SCM Specialist	Senior Quality Specialist	Manager	No Level	Flight Safety Instructor	Flight Safety Instructor
6	Assistant Technical Support Services Engineer	Ground Handling Executive	Assistant SCM Specialist	Quality Specialist	Senior Engineer	No Level	Captain	Captain
5	Technical Support Engineer*	Ground Handling Officer	SCM Engineer	Quality Assurance Engineer*	Engineer	No Level	Senior First Officer	Senior First Officer
4	No Level	Ground Handling Agent	No Level	Quality Assurance Assistant Engineer*	Assistant Engineer	In-Flight Supervisor	First Officer	First Officer
3	No Level	Ground Handling Assistant	No Level	No Level	Senior Technician	Chief	Second Officer	Second Officer
2	No Level	No Level	No Level	No Level	Technician	Cabin Crew	No Level	No Level
1	No Level	No Level	No Level	No Level	Assistant Technician	No Level	No Level	No Level



#### 4.4 OCCUPATIONAL DESCRIPTION (OD)

The OD describes the occupations under the Aerospace Industry OS in terms of competencies and duties that are designated to be performed by competent personnel. The OD is usually referred to by JPK's certified facilitators prior to the development of the relevant NOSS. The OD can also be referred by potential job candidates, students, academicians, skills training trainers and industry practitioners.

Academic institutions or skills training institutions may also refer to the OD to develop their curriculum as they will be able to understand what is required and expected of those in the particular occupations.

The OD has five (5) parts, which includes (an example is shown below):

- a) Sub-sector
- b) Job Title and Level
- c) Occupational Definition
- d) List of Responsibilities
- e) Knowledge, Skills and Attitude

Samples of OD have been developed for some of the critical job titles identified. Please refer to the details of these OD in Annex 4 of this report.

ODs of sub-areas that are common for other industries such as Aircraft Welding, Non Destructive Testing (NDT), Electrical, Quality Control and Quality Assurance are not included as they can be found in the OF reports of the relevant industries.



## An example Occupational Description of a Job Title:-

### **SUB-SECTOR: MAINTENANCE REPAIR OVERHAUL (MRO)**

#### **Job Title: Licensed Aircraft Engineer (LAE) Level 5**

An aircraft maintenance engineer is responsible for ensuring an aircraft operates properly and safely. A maintenance engineer may make repairs, troubleshoot problems, conduct inspections and make upgrades to aircrafts. Daily duties may include keeping records of and performing scheduled maintenance, making emergency repairs, or preparing for inspections.

#### **Responsibilities may include:**

- Troubleshooting aircraft system defects
- Identifying defects or problems and need the appropriate actions in accordance with the approved maintenance data.
- Supervising or performing maintenance on aircraft engines and associated equipment and systems to ensure compliance with the work scope.

#### **Knowledge, Skills, Attitude**

A **Licensed Aircraft Engineer** requires:

- an attitude that is self-reliant, highly motivated and self-disciplined
- effective communication skills
- good housekeeping skills
- familiarity with approved maintenance data
- competency to interpret approved data whether issued by the Aircraft or Engine Manufacturer or OEM – Original Equipment Manufacturer



## 4.5 SKILLS IN DEMAND

This section elaborates the jobs and skills in demand obtained via Survey, Focus Group discussion and Industry visits.

### 4.5.1 Jobs In Demand

It has been analysed that the Aerospace Industry requires manpower in the job areas specified below:

No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
1	<b>Aircraft Maintenance</b>		
1.1	Avionic Licenced Aircraft Engineer (LAE) Level 5 and above	<ul style="list-style-type: none"> <li>• Career advancement.</li> <li>• Migration to lucrative markets.</li> <li>• Lack of training organisation offering the course.</li> <li>• New demands with emergence of new MRO.</li> <li>• Lack of potential candidates taking apprenticeship for LAE.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Overall they are required to carry out and certify inspection, repair, modification, replacement, trouble shooting, overhaul, functional and operational testing on aircraft avionics system (instruments, radio and electrical).</li> <li>• Detailed knowledge of the theoretical and practical aspects of the aircraft avionics and maintenance system.</li> <li>• Knowledge and skills in safety awareness and airworthiness requirements of avionics systems.</li> <li>• Knowledge and skills in using avionics instruments and test equipment.</li> <li>• Ability to use mathematical formulae related to maintenance systems.</li> <li>• Ability to read, understand and prepare sketches, simple drawings and schematics describing aircraft and maintenance systems.</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
			<ul style="list-style-type: none"> <li>• Ability to interpret results from various sources and measurements and apply corrective action where appropriate.</li> <li>• Ability to apply basic physics principles in aircraft maintenance.</li> <li>• Ability to manage the service, repair, and overall avionics maintenance of aircraft and verify aircraft is safe for flight and compliant with FAA regulations.</li> <li>• Ability to oversee the scheduling and timely completion of avionics repairs and maintenance while ensuring budget adherence.</li> <li>• Ability to provide input to strategic decisions that affect the functional area of responsibility to senior level management.</li> <li>• Capable of resolving escalated issues arising from maintenance and flight operations which include coordination with other departments.</li> </ul>
1.2	Sheet Metal Technician	<ul style="list-style-type: none"> <li>• New demands with emergence of new MRO.</li> <li>• Migration to lucrative markets.</li> <li>• Lack of experienced and competent specialist to train new technician.</li> <li>• Job opportunities should be particularly good for sheet metal workers who complete apprenticeship training or who are certified welders.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Overall they are required to carry out and certify sheet metal and aircraft structures repair, modification and replacement as per approved repair schemes.</li> <li>• Computer skills such as designing and cutting sheet metal which often requires the use of computer-aided drafting and design (CADD) programs plus building</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
			<p>information modelling (BIM) systems.</p> <ul style="list-style-type: none"> <li>• Manual dexterity as sheet metal workers need good hand-eye coordination to make precise cuts and bends in metal pieces.</li> <li>• Mechanical skills when using tools such as saws, lasers, shears, and presses to do their job. As a result, they should have good mechanical skills in order to help operate and maintain equipment.</li> <li>• Sheet metal workers must be able to lift and move sheet metal work that is often heavy.</li> <li>• Skills in spatial relationships because airplane manufacturing requires the placement of structural metal pieces to be precise when using hand-held tablets. For example, workers must be able to compare the installed sheet metal to the design specifications.</li> </ul>
1.3	Aircraft Painting Technician	<ul style="list-style-type: none"> <li>• New demands with emergence of new MRO.</li> <li>• Migration to lucrative markets.</li> <li>• Certificate or degree programs for aircraft painting are rare, but they are available. The advantage of enrolling in an aircraft paint technology program includes coursework that teaches students aircraft-specific skills.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Overall they are required to carry out and certify paint stripping, protective corrosion treatment and re-painting of aircraft and components as per approved painting standards/specifications.</li> <li>• Knowledge of paint processes, products and equipment including epoxies, enamels, lacquer, urethanes and acrylics; ability to read blueprints and engineering</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
			<p>documentation and use spray paint guns.</p> <ul style="list-style-type: none"> <li>• Paint technology is constantly improving, often to comply with Environmental Protection requirements and minimise the environmental effects of toxic substances and fumes. An aircraft painter seeking to advance their career should ensure continued proficiency with the latest paint removal products and coatings to remain competitive.</li> </ul>
1.4	NDT Technician	<ul style="list-style-type: none"> <li>• New demands with emergence of new MRO.</li> <li>• Migration to lucrative markets.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• To carry out and certify NDT checks on aircraft structures, wings and components such as wheel hubs and landing gear as per approved NDT manuals and processes.</li> <li>• Ability to set up and standardise equipment, conducts tests, interpret and evaluate findings in compliance with required specifications, standards and or customer specifications.</li> <li>• Knowledge of Industry Codes.</li> <li>• Knowledge of NDT equipment and ability to effectively perform assigned NDT inspection.</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
2	<b>Air Traffic Systems</b>		
2.1	Assistant Communication Maintenance Engineer	<ul style="list-style-type: none"> <li>• New Project Involvement.</li> <li>• Business Expansions.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Knowledge on ICAO and DCA standards.</li> <li>• Knowledge on Air Traffic Services and operational environment.</li> <li>• Knowledge on Air Space Standards, Aeronautical Information Systems.</li> <li>• Knowledge on Meteorology and altimetry.</li> <li>• Knowledge on Communication, Navigation, Surveillance &amp; Air Traffic Management (CNS/ATM) concepts.</li> <li>• Knowledge of human factors in ATSEP work to decrease the accident rate.</li> </ul>
2.2	Assistant Navigation Maintenance Engineer	<ul style="list-style-type: none"> <li>• New Project Involvement.</li> <li>• Business Expansions.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Knowledge on ICAO and DCA standards.</li> <li>• Knowledge on Air Traffic Services and operational environment.</li> <li>• Knowledge on Air Space Standards, Aeronautical Information Systems.</li> <li>• Knowledge on Meteorology and altimetry.</li> <li>• Knowledge on Communication, Navigation, Surveillance &amp; Air Traffic</li> </ul>





No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
			Management (CNS/ATM) concepts. <ul style="list-style-type: none"> <li>• Knowledge of human factors in ATSEP work to decrease the accident rate.</li> </ul>
2.3	Assistant Surveillance Maintenance Engineer	<ul style="list-style-type: none"> <li>• New Project Involvement.</li> <li>• Business Expansions.</li> </ul>	Those in this job area require the following skills : <ul style="list-style-type: none"> <li>• Knowledge on ICAO and DCA standards.</li> <li>• Knowledge on Air Traffic Services and operational environment.</li> <li>• Knowledge on Air Space Standards, Aeronautical Information Systems.</li> <li>• Knowledge on Meteorology and altimetry.</li> <li>• Knowledge on Communication, Navigation, Surveillance &amp; Air Traffic Management (CNS/ATM) concepts.</li> <li>• Knowledge of human factors in ATSEP work to decrease the accident rate.</li> </ul>
2.4	Assistant Air Traffic Management Maintenance Engineer	<ul style="list-style-type: none"> <li>• New Project Involvement.</li> <li>• Business Expansions.</li> </ul>	Those in this job area require the following skills : <ul style="list-style-type: none"> <li>• Knowledge on ICAO and DCA standards.</li> <li>• Knowledge on Air Traffic Services and operational environment.</li> <li>• Knowledge on Air Space Standards, Aeronautical Information Systems</li> <li>• Knowledge on Meteorology and altimetry.</li> <li>• Knowledge on Communication, Navigation, Surveillance &amp; Air Traffic Management (CNS/ATM) concepts.</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
			<ul style="list-style-type: none"> <li>• Knowledge of human factors in ATSEP work to decrease the accident rate.</li> </ul>
<b>3</b>	<b>Production</b>		
3.1	Welder (Especially titanium welding)	<ul style="list-style-type: none"> <li>• Nature of business and products require welders with aerospace background and are experienced in titanium welding.</li> <li>• The supply for welders is mostly from general industries or oil and gas. In addition, there is a lack of those with experience in titanium welding.</li> <li>• Titanium Welding is a very expensive process and is usually only performed by welders who have years of experience and have a specialty in the field of titanium welding. Due to the amount of skill and knowledge required to properly weld titanium, it is an aspect of the welding field that is not suited for beginners.</li> <li>• Many welders have practiced and worked in the field for many years before they feel that they are skilled enough to attempt the titanium welding process. It is a very intimidating metal to work with and the skill</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Manipulative technique and the characteristics of stainless steel and titanium welding.</li> <li>• To be able to produce quality welds on thin gauge materials.</li> <li>• Understanding of gas tungsten arc welding on thin gauge stainless steel and titanium.</li> <li>• Skills necessary to produce quality welds on stainless steel and titanium in the flat and horizontal positions.</li> <li>• Skills for fitting and welding of Titanium, steel, aluminium and stainless steel parts using TIG/MIG process.</li> <li>• Setting up welding machines based on the job at hand or using a Welding Procedure Specification.</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
		required takes years to gain.	
3.2	Assembly Technician	<ul style="list-style-type: none"> <li>As a company grows, more work packages come with assembly jobs.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>Able to understand the specifications and requirements.</li> <li>Able to use special tools/equipment.</li> </ul>
<b>4</b>	<b>Engineering</b>		
4.1	CNC Machinist	<ul style="list-style-type: none"> <li>Nature of business and products require them to have experience in machining large sized products. There are quite a number of machinist in the market, however they are only experienced in machines for small sized products.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>Ability to read and communicate in English and understand safety rules, operating &amp; maintenance instructions, and procedure manuals.</li> <li>Ability to interpret blueprint/engineering drawings.</li> <li>Ability to apply CNC programs.</li> </ul>
<b>5</b>	<b>Quality (NDT)</b>		
5.1	NDT Level 3	<ul style="list-style-type: none"> <li>Shortage of NDT Level 3 in the market</li> <li>NDT personnel are currently in demand.</li> <li>The industry is having issues on retention of NDT personnel.</li> <li>Lack of experienced technician with aviation quality system knowledge.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>Conducting NDT for the acceptance of parts.</li> <li>Skills on appropriate methods and techniques for an NDT inspection.</li> <li>Preparing and verifying the adequacy of an NDT procedure, work instructions and written practice.</li> <li>Skills to provide training, examination and certification of personnel.</li> </ul>
<b>6</b>	<b>Unmanned Aerial Vehicle</b>		



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
6.1	Pilots and Technical Expertise	<ul style="list-style-type: none"> <li>• New emerging activities and vast potential in the aviation industry worldwide.</li> <li>• Increasing focus on use of drones for surveillance, security and monitoring purposes.</li> <li>• Introduction of courses on Drones and UAVs in the Higher Education sector.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Knowledge and skills on how to operate UAVs, its regulations and law enforcement involving UAVs in regards to Malaysia's civil aviation laws.</li> </ul>
<b>7</b>	<b>Aircraft Structure Engineering</b>		
7.1	Composite Technician	<ul style="list-style-type: none"> <li>• Industry not producing enough skilled technicians.</li> <li>• To contribute to the growth of composite repair and engineering.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Precise measuring, labelling and cutting materials.</li> <li>• Preparing of detailed and complete documents.</li> <li>• Organise work systematically.</li> </ul>
<b>8</b>	<b>Continuing Airworthiness Management Organisation (CAMO)</b>		
8.1 8.2 8.3 8.4	<ul style="list-style-type: none"> <li>• Engineering services</li> <li>• Quality</li> <li>• Planning</li> <li>• Airworthiness Review Staff</li> </ul>	<ul style="list-style-type: none"> <li>• Airworthiness is a critical aspect of ensuring safety and acceptance of aerospace product.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Knowledge of (Introduction to) DCAM Part-M under MCAR-2016, AN 6101 and AN 6102.</li> <li>• Improve aircraft availability, whilst minimising ineffective tasks and reducing maintenance costs.</li> <li>• Eliminate recurring faults and improve Maintenance Programme effectiveness.</li> <li>• Improve the Regulators' confidence in the organisation.</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
			<ul style="list-style-type: none"> <li>• Ensuring that maintenance has been performed in accordance with all regulatory and company procedures.</li> <li>• Coordination of defect rectification.</li> <li>• The control and preparation of maintenance programs and aircraft documents.</li> <li>• Assessing Airworthiness Directives.</li> <li>• Monitoring aircraft utilisation.</li> <li>• Ensuring that all continued airworthiness records are verified and all information is updated on the CAMO.</li> </ul>
<b>9</b>	<b>Quality Management</b>		
9.1	<ul style="list-style-type: none"> <li>• Quality Assurance Assistant Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• Companies at times require dedicated resources to develop, implement and support a properly functioning quality system.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Problem-solving technique.</li> <li>• Attention to details.</li> <li>• Team oriented.</li> <li>• Understanding of Quality Systems and ISO.</li> <li>• Knowledge of BCAR/MCAR/FAA and other NAA regulations.</li> <li>• Compliance monitoring requirements and auditing of all elements of DCAM Part-145 and Part-M.</li> </ul>
9.2	<ul style="list-style-type: none"> <li>• Quality Assurance Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• When properly implemented, a quality management system requires significantly less resources for its on-going maintenance. It is also essential that the quality system implementation is planned in a way which gives priority to these functions which directly affect the revenue.</li> </ul>	
<b>10</b>	<b>Engineering &amp; Design</b>		
10.1	Design Engineer	<ul style="list-style-type: none"> <li>• Design engineers are needed for Tooling</li> </ul>	Those in this job area require the following skills :



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
		<p>Design to support manufacturing.</p> <ul style="list-style-type: none"> <li>• Design engineers are required for concession and repair design works to support MRO and manufacturing.</li> <li>• There are limited candidates in this specialised job area.</li> </ul>	<ul style="list-style-type: none"> <li>• Proficiency in Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) software such as CATIA or NX.</li> <li>• Familiarity with aerospace quality standards and practices.</li> <li>• Basic manufacturing knowledge including tooling, jigs and fixtures basics.</li> <li>• Proficiency in technical English language</li> <li>• Ability to generate aerospace standard engineering drawings including BOM and 3D modelling.</li> <li>• Ability to visualise and conceptualise component 3D models from engineering drawings.</li> <li>• Familiarity with documentation, standards and specifications.</li> <li>• Ability to produce engineering drawings and 3D modelling adhering to the standards and best practises of Aerospace Industry.</li> <li>• Knowledge of aerospace product and design lifecycle (i.e. conceptual design, preliminary, detailed design, design for manufacturing).</li> <li>• Pro-active in getting up to date with the latest CAD Software, technology and Design Standards.</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
10.2	Compliance Verification Engineer (CVE)	<ul style="list-style-type: none"> <li>• It is a requirement that each approved design organisation MUST have a CVE, therefore there is a demand from the industry for this personnel.</li> <li>• The approval process is stringent because the individual must be approved directly by DCA.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Demonstrates an excellent understanding of related design standards.</li> <li>• Possess at least 3 years of experience in continued airworthiness and modification processing.</li> <li>• Demonstrate to have profound knowledge about the details of the compliance.</li> <li>• Demonstrate to have good knowledge and understanding in related regulatory requirements i.e. (MCAR 1996, DCA AN), airworthiness and environmental protection requirements (EASA, CS, FAA FAR etc.) as well as interpretations and means to provide compliance with these requirements.</li> <li>• Experienced in identifying areas in the respective compliance documents and information or instructions for continued airworthiness which have to be corrected, reworked or improved from the technical point of view.</li> </ul>



No.	Job Area/ Job titles	Factor(s) contributing to the demand	Specific requirements and skills
10.3	Airworthiness Engineer	<ul style="list-style-type: none"> <li>• It is a requirement that each approved design organisation must have an airworthiness engineer.</li> <li>• Therefore there is a demand from the industry for this personnel.</li> <li>• The approval process is stringent because the individual must be approved directly by DCA.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Possess at least 1 year of experience as a CVE</li> <li>• Demonstrate to have profound knowledge and understanding of AN96 Design Organisation procedures and requirements, or equivalent.</li> <li>• Experienced in checking compliance documents for appropriateness and adequacy to provide compliance with the relevant airworthiness requirements.</li> <li>• Experienced in verifying that the compliance documents are complete and comprehensive with regard to the subject Type Investigation programme.</li> </ul>
<b>11</b>	<b>Engineering Services</b>		
11.1	Engineering Services Engineer	<ul style="list-style-type: none"> <li>• The industry requires more Engineering Services Engineers with capabilities to develop Engineering Services Instructions and possess knowledge and skills to comply with stage certification requirements.</li> </ul>	<p>Those in this job area require the following skills :</p> <ul style="list-style-type: none"> <li>• Development of Engineering Services Instructions.</li> <li>• Knowledge of task breakdown to comply to stage certification requirements.</li> </ul>





#### 4.5.2 Skills Gaps

The Aerospace Industry currently faces a skills gap of workers who require the following technical and soft skills:

No.	Skills in demand	Factors contributing to the demand	Description of the skills in demand
1.	Aircraft Painting	<ul style="list-style-type: none"> <li>No structured training for the trade, however there is an existing NOSS developed by JPK for aircraft painting.</li> <li>New demands with emergence of new MRO.</li> <li>Migration to lucrative markets.</li> </ul>	<ul style="list-style-type: none"> <li>Precision painting skills that require in depth knowledge of method, material specifications, engineering instructions and drawings.</li> </ul>
2.	Sheet Metal	<ul style="list-style-type: none"> <li>No structured training for the trade, however there is an existing NOSS developed by JPK for sheet metal.</li> <li>New demands with emergence of new MRO.</li> <li>Migration to lucrative markets.</li> </ul>	<ul style="list-style-type: none"> <li>Aircraft structure repair that requires specific skills with in depth knowledge and understanding of aircraft structures, materials, repair instructions and engineering drawing.</li> </ul>
3.	Electronic - IT	<ul style="list-style-type: none"> <li>Competency requirement of the related job area.</li> <li>Technological advancements.</li> </ul>	<ul style="list-style-type: none"> <li>Electronic background with Information Technology added value/knowledge related to system architecture.</li> </ul>
4.	Welding Engineer	<ul style="list-style-type: none"> <li>Limited supply of qualified Welding personnel.</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge in NADCAP, standards and lab requirements among others.</li> <li>Responsible for maintaining Welder approval.</li> <li>To define and manage Welder training requirements.</li> </ul>



No.	Skills in demand	Factors contributing to the demand	Description of the skills in demand
5.	NDT Level 3 NDT Level 2	<ul style="list-style-type: none"> <li>• Limited in the market due to:               <ul style="list-style-type: none"> <li>✓ Required to work high number of OJT hours</li> <li>✓ Examination oriented</li> <li>✓ Highly regulated</li> </ul> </li> <li>• Rapid growth in MRO area.</li> <li>• Lack of institutions focusing on specific aviation quality systems requirements.</li> <li>• Specialists to train technicians and provide oversight.</li> </ul>	<ul style="list-style-type: none"> <li>• Required to manage NDT programs, develop, quality and approve procedures.</li> <li>• To possess technician's level skills set.</li> <li>• Require Certification from the National Aerospace Standard – 410 and on job training.</li> </ul>
6.	Titanium Welders	<ul style="list-style-type: none"> <li>• As most products are made of titanium and most welders in the market are only trained in materials such as Inconel metal, aluminium or stainless steel, therefore the current welders are not skilled specifically for welding titanium.</li> </ul>	<ul style="list-style-type: none"> <li>• Fitting and welding titanium, steel and aluminium parts using TIG/MIG process.</li> </ul>
7.	Green Technology	<ul style="list-style-type: none"> <li>• In accordance with Government's legislative requirements.</li> <li>• Current industrial environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge and Skills required for fulfilling ISO requirements (50001).</li> <li>• ISO 14000</li> </ul>
8.	Spacecraft Electronics Assembler	<ul style="list-style-type: none"> <li>• Production of spacecraft electronics requiring highly specialised skills and standards certification.</li> </ul>	<ul style="list-style-type: none"> <li>• Skills certification compliant or equivalent to European Space Agency (ESA) and European Cooperation for Space Standardisation (ECSS).</li> </ul>



No.	Skills in demand	Factors contributing to the demand	Description of the skills in demand
9.	Unmanned Aerial Vehicles (UAV) related skills	<ul style="list-style-type: none"> <li>• UAV is an emerging technology used worldwide based on aerospace requirements.</li> <li>• Increasing focus on use of drones for surveillance, security and monitoring purposes.</li> <li>• Introduction of courses on Drones and UAVs in the Higher Education sector.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge and skills on how to operate UAVs, its regulations and law enforcement revolving UAVs in regards to Malaysia's civil aviation laws.</li> <li>• UAV Systems Design, Integration and Mission Design to enable the exploitation of UAV technology in platforms, communications, payloads and software for various applications.</li> </ul>
10.	Quality Control Analysis	<ul style="list-style-type: none"> <li>• In accordance with production requirements to meet industry standards.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge and Skills to fulfil ISO requirements.</li> </ul>
11.	Quality Assurance Management	<ul style="list-style-type: none"> <li>• International and local authorities' requirements for any certification.</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding of Quality Systems and ISO.</li> <li>• Knowledge of BCAR/MCAR/FAA and other NAA regulations.</li> <li>• For satellite manufacturing: NASA or ECSS standards or equivalent.</li> </ul>
12.	IT enablers (CATIA, SAP, MATLAB, CFD, etc.)	<ul style="list-style-type: none"> <li>• Increased complexity in supply chain management.</li> <li>• Usage of IT infrastructure to assist rapid modelling.</li> </ul>	<ul style="list-style-type: none"> <li>• Usage of cloud-based software to integrate sensitive data, such as examination database (for ATOs), MRO business activities (client database and flight tracking).</li> </ul>
13.	Knowledge and experience on NG (New Generation) aircraft	<ul style="list-style-type: none"> <li>• Advancement in aircraft designs to accommodate increasing number of passengers.</li> <li>• New aircraft deliveries across the world comprise of NG aircraft, such as:</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge and experience on NG aircraft will be in demand as airlines look towards more cost-effective aircraft designs.</li> </ul>



No.	Skills in demand	Factors contributing to the demand	Description of the skills in demand
		<ul style="list-style-type: none"> <li>a) A330neo</li> <li>b) A321neo</li> <li>c) A319neo</li> <li>d) A350-1000</li> <li>e) 737 Max</li> </ul>	
14.	Soft skills training and development	<ul style="list-style-type: none"> <li>• Aircraft Maintenance Organisations described young engineers today lack the essential soft skills, such as leadership qualities, effective communication, team-work, organisational vision.</li> </ul>	<ul style="list-style-type: none"> <li>• Young engineers need to have leadership qualities in order to work with technicians and semi-skilled mechanics.</li> <li>• Effective communication skills are important in this line of work, where miscommunication can lead to hazard or damages.</li> <li>• Need to encourage mind-set change of technical staff, such as increasing the culture of positivity, performance &amp; productivity in the workplace, increase leadership effectiveness and creating a sustainable attitude.</li> </ul>
15.	English language literacy and proficiency	<ul style="list-style-type: none"> <li>• Local engineers lack the English language proficiency to compete with engineers abroad.</li> <li>• Increasingly more global flight operations and the MRO sector require effective communication with international clients.</li> </ul>	<ul style="list-style-type: none"> <li>• Proficiency in the English language in reading, writing and communicating with confidence with English-speaking natives.</li> </ul>
16.	Problem solving and analytical skills	<ul style="list-style-type: none"> <li>• Challenging and competitive global business.</li> <li>• Fast changing technology.</li> </ul>	<ul style="list-style-type: none"> <li>• Aerospace requires talents (i) who are strong in lateral, critical and analytical thinking, (ii) who are intellectually curious and always challenge the norms and conventions, (iii) who are able to think outside the</li> </ul>



No.	Skills in demand	Factors contributing to the demand	Description of the skills in demand
			box, (iv) who are fast learners and able to grasp new ideas and concept with ease, and (v) responsive to change.
17.	Agility and Adaptability skills	<ul style="list-style-type: none"> <li>• Challenging and competitive global business.</li> <li>• Fast changing technology.</li> </ul>	<ul style="list-style-type: none"> <li>• The workforce should show (i) ability to adapt successfully to changing situations and environment; (ii) ability to learn from experience and apply that learning immediately to perform successfully in new situations; (iii) willingness to learn new methods and procedures and be open minded (iv) versatile.</li> </ul>
18.	NC programming	<ul style="list-style-type: none"> <li>• Currently most work packages use 5 axis for trimming.</li> <li>• Not all candidates are trained with CATIA, some of them are only skilled in the use of Auto CAD.</li> </ul>	<ul style="list-style-type: none"> <li>• Skills in 5 Axis for trimming.</li> <li>• NC Programmer skills set.</li> <li>• Use of Auto CAD software.</li> </ul>
19.	Geometric Dimensioning and Tolerancing (GD & T)	<ul style="list-style-type: none"> <li>• GD &amp; T is basic knowledge that all engineers need to have; it is a system for defining and communicating engineering tolerances. It uses a symbolic language on engineering drawings and computer generated three-dimensional solid models that explicitly describe nominal geometry and its allowable variation.</li> <li>• Many new graduates are not well versed in GD &amp; T.</li> </ul>	<ul style="list-style-type: none"> <li>• Engineers need to have this knowledge since their work will involve a lot of engineering drawing.</li> </ul>

#### 4.5.3 Emerging Skills



In addition to the specific technical and soft skills highlighted above, the Aerospace Industry also requires a generation of workers with the following emerging skills in the near future due to industry technological advancements and global market demand:

No	Emerging Skills	Factors contributing to the demand	Description of the emerging skills in demand
1	Aircraft MRO Enterprise Resource Planning (ERP) used by System Specialists in Aircraft maintenance	<ul style="list-style-type: none"> <li>• More and more organisations are implementing ERP to integrate back office business processes and facilitate the flow of information within an organisation so business decisions can be data-driven. This in turn will increase efficiency, productivity and optimise cost to ensure business sustainability.</li> <li>• Avionics skills integration into mechanical skills.</li> </ul>	<ul style="list-style-type: none"> <li>• Information technology, business information systems or management information systems specialist that is able to communicate with users at all levels of the organisation. He or she also must be able to instruct or train others and must respond to changes in business process requirements quickly with on-the-go strategies and solutions. It is also vital that any changes made to the business process be completed within the optimal time frame, with minimal cost and minimised risk.</li> </ul>
2	<ul style="list-style-type: none"> <li>• NC Programmers Engineering</li> <li>• CAD Technician skills</li> </ul>	<ul style="list-style-type: none"> <li>• Increase in dependency of machining requires skilled programmers.</li> <li>• Requires time to build skills which should be via on job training.</li> </ul>	<ul style="list-style-type: none"> <li>• To support the Manufacturing Department in creating and editing NC programs and equipment used in the production of machined and fabricated parts.</li> </ul>
3	<ul style="list-style-type: none"> <li>• CMM Programming</li> <li>• Quality Inspection</li> </ul>	<ul style="list-style-type: none"> <li>• Critical aircraft components/parts, precision in product inspection and measuring is required.</li> </ul>	<ul style="list-style-type: none"> <li>• To provide CMM and other measurement data for sample part inspection</li> </ul>



No	Emerging Skills	Factors contributing to the demand	Description of the emerging skills in demand
			<ul style="list-style-type: none"> <li>To conduct part layouts and capability studies to assure parts meet or exceed specified dimensional requirements.</li> </ul>
4	Big Data Analytics (IR 4.0)	<ul style="list-style-type: none"> <li>Changes in new technology.</li> <li>Evolving customer/user requirement &amp; demand.</li> </ul>	<ul style="list-style-type: none"> <li>Importing/Collecting, cleaning, converting and analysing the data for the purpose of find insights and making conclusions.</li> </ul>
5	Big Data Analytics Engineering	<ul style="list-style-type: none"> <li>Early detection on components and equipment deviation can significantly improve the assurance of quality and supply in the downstream production in Assembly and Test &amp; End Items.</li> </ul>	<ul style="list-style-type: none"> <li>The job requires the person to be able to develop new scripts or familiar with existing available data analytics software to produce a useful Predictive Modelling platform.</li> <li>The job also requires strong knowledge on statistical and mathematical modelling in order to generate an effective predictive modelling that can be used to interpret a large pool of data from process or test and on a real time basis and predict any deviation that can eventually lead to failure. This includes equipment and product performance analytics.</li> </ul>
6	Avionics Component/ Material Specialist, SQE SCM	<ul style="list-style-type: none"> <li>Niche A&amp;D component with unique design and fabrication process such as connectors require certain special knowledge to interpret its FFF (form, fit and</li> </ul>	<ul style="list-style-type: none"> <li>The personnel need to be familiar with Avionics component design guideline and have adequate exposure in the related field.</li> </ul>



No	Emerging Skills	Factors contributing to the demand	Description of the emerging skills in demand
		function) and perform compatibility study.	
7	3D rapid modelling and prototyping	<ul style="list-style-type: none"> <li>• Digitalisation of maintenance, design and services.</li> <li>• Moving towards Internet of Things (IoT).</li> </ul>	<ul style="list-style-type: none"> <li>• 3D rapid modelling and prototyping in design , customer experience/service and retrofit &amp; modification</li> </ul>
8	Content digitalisation and modelling used in aircraft maintenance and retrofit & modification	<ul style="list-style-type: none"> <li>• Digitalisation of maintenance, design and services.</li> <li>• Moving towards Internet of Things (IoT).</li> </ul>	<ul style="list-style-type: none"> <li>• Manufacturing with 3D Printing enables faster iteration, decision making, and response to market changes.</li> <li>• Fixtures and flight-worthy parts go from idea to production in a fraction of the time.</li> </ul>
9	Additive Manufacturing (3D Printing)	<ul style="list-style-type: none"> <li>• Additive Manufacturing (AM) is a term used to describe the manufacture of products using digitally controlled machine tools and is often termed 3D printing.</li> <li>• The approach differs from traditional manufacturing in that all Additive Manufacturing processes use a layer-by-layer approach to build up components rather than through machining from solid, moulding or casting.</li> <li>• Additive Manufacturing is of major strategic importance within the aerospace sector.</li> <li>• The aerospace sector is adopting Additive Manufacturing technology at a rapid rate</li> </ul>	<ul style="list-style-type: none"> <li>• Technology and Skills in Aerospace industry.</li> <li>• The adoption of new technologies such as Composites and Additive Manufacturing are starting to expand throughout the supply chain.</li> </ul>





No	Emerging Skills	Factors contributing to the demand	Description of the emerging skills in demand
		<p>and is expected to be a major driver in the commercialisation of Additive Manufacturing processes over the next five years.</p> <ul style="list-style-type: none"> <li>• There is a general lack of Additive Manufacturing training available.</li> <li>• The training that is undertaken tends to be on the job and in house, with expertise currently concentrated with in those employers.</li> </ul>	
10.	Adaptive technology (Simulators for ground operations management)	<ul style="list-style-type: none"> <li>• Advanced and modern technological systems are currently being tested and used to help future aircraft engineers and technicians learn better through a stimulated environment.</li> <li>• The use of Virtual Reality (VR) technology to simulate a maintenance environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Usage of simulators for ground operations, such as ground handling, maintenance, dealing with emergency maintenance situations to help future engineers and technicians understand their job scope better and can respond quickly during emergencies.</li> </ul>

#### 4.6 CHAPTER CONCLUSION

Based on the discussions with panel members during the development workshops and survey findings, the OS has been presented in this chapter. The OS would enable the Aerospace Industry to be interpreted at a glance in terms of the competency or job areas applicable to the industry and the skill level of the different job titles, according to the MOSQF Level Descriptors, available career paths. The jobs and skills in demand and emerging skills required in the near futures were provided in this section.



# CHAPTER 5:

## DISCUSSION, RECOMMENDATION & CONCLUSION

### 5.1 DISCUSSION

In order to be more productive and have high employability in the Aerospace Industry, the workforce should be equipped with specialised technical skills specific to certain job areas, possess technological acumen and consistent adherence to regulatory requirements. Exposure to hands-on training is another strategy to ensure a competent workforce who will have a more comprehensive understanding of the industry.

The NOSS acts as a tool to bridge the skills gaps as identified in Chapter 4, this is because the NOSS is based on input from the industry to deliver skills training and has a component of hands on training and practical skills assessment. Skills training based on the NOSS also has the option of trainees undergoing apprenticeship which is seen as an effective method of training with hands on experience prior to entering the workforce. Development of NOSS at higher levels of competency for the Aerospace Industry is also seen as imperative in order to develop a workforce who are technically specialised at higher levels. Those with academic qualifications will also be able to pursue skills certification for these specialised areas via various methods as practiced by JPK.

### 5.2 RECOMMENDATIONS

The following are specific recommendations proposed by the industry to address the issues of skills gaps and to produce workforce supply for the jobs in demand highlighted in this document.

#### i. **NOSS Development and Review**

In order to determine the various NOSS that have already been developed for, or are relevant to the Aerospace Industry, the existing NOSS should be identified. The list of NOSS in Table 5.1 shows the matrix of the current NOSS job areas against the Aerospace Industry sub-sectors as identified in the OS. From this table, job areas that do not have a NOSS developed yet can be determined.



**Table 5.1: Matrix of Existing NOSS against relevant Aerospace Industry Sub-sectors and Job Areas**

Existing Aerospace Industry Sub-Sector/NOSS Job Areas	SUB-SECTORS OF THE AEROSPACE INDUSTRY					
	Maintenance Repair Overhaul (MRO)	Manufacturing	System Integration	Engineering & Design	Continuing Airworthiness Management Organisation (CAMO)	Aerospace Support Services
TP-060-5:2013 Aircraft Maintenance Operation and Certification (25-10-10),(30-12-2013)	X					
TP-060-4:2013 Aircraft Maintenance Operation and Certification (Limited Maintenance Authorization) (25-10-10),(30-12-2013)	X					
TP-060-3:2013 Aircraft Maintenance Operation (Non Certifying) (24-09-98) (07-10-99) (30-12-2013)	X					
TP-071-5 Aircraft Maintenance Engineer Avionics (Electrical) (25-10-10)	X					
TP-072-5 Aircraft Maintenance Engineer Avionics (Instrument) (25-10-10)	X					



SUB-SECTORS OF THE AEROSPACE INDUSTRY						
Existing Aerospace Industry Sub-Sector/NOSS Job Areas	Maintenance Repair Overhaul (MRO)	Manufacturing	System Integration	Engineering & Design	Continuing Airworthiness Management Organisation (CAMO)	Aerospace Support Services
TP-070-4 Aircraft Maintenance Technician (Avionics) (25-10-10)	X					
TP-076-3:2012 Aircraft Structure Repair-Composite (23-10-12)	X					
TP-073-3:2012 Aircraft Structure Repair-Sheet Metal (23-10-12)	X					
TP-074-3:2012 Aviation Welding (18-12-2012)		X				
TP-074-2:2012 Aviation Welding (18-12-2012)		X				
TP-074-1:2012 Aviation Welding (18-12-2012)		X				
TP-075-3:2012 Aviation Painting (18-12-2012)	X					
TP-075-2:2012 Aviation Painting (18-12-2012)	X					



Existing Aerospace Industry Sub-Sector/NOSS Job Areas	SUB-SECTORS OF THE AEROSPACE INDUSTRY					
	Maintenance Repair Overhaul (MRO)	Manufacturing	System Integration	Engineering & Design	Continuing Airworthiness Management Organisation (CAMO)	Aerospace Support Services
TP-075-1:2012 Aviation Painting (18-12-2012)	X					
MC-116-3:2014 Eddy Current Testing(ET)- Aerospace Materials, Components & Structures (16- 12-2014)		X				
MC-116-2:2014 Eddy Current Testing(ET)- Aerospace Materials, Components & Structures (16- 12-2014)		X				
MC-116-1:2014 Testing(ET)- Aerospace Materials, Components & Structures (16-12-2014)		X				
MC-117-3:2014 Radiographic Testing(RT)- Aerospace Materials, Components & Structures (16- 12-2014)		X				
MC-117-2:2014 Radiographic Testing(RT)- Aerospace Materials,		X				



<b>SUB-SECTORS OF THE AEROSPACE INDUSTRY</b>						
<b>Existing Aerospace Industry Sub- Sector/NOSS Job Areas</b>	<b>Maintenance Repair Overhaul (MRO)</b>	<b>Manufacturing</b>	<b>System Integration</b>	<b>Engineering &amp; Design</b>	<b>Continuing Airworthiness Management Organisation (CAMO)</b>	<b>Aerospace Support Services</b>
Components & Structures (16-12-2014)						
MC-117-1:2014 Radiographic Testing(RT)- Aerospace Materials, Components & Structures (16-12-2014)		X				
MC-062-3 Aerospace Ultrasonic Tester (UT) (25-10-10)		X				
MC-062-2 Aerospace Ultrasonic Tester (UT) (25-10-10)		X				
MC-062-1 Aerospace Ultrasonic Tester (UT) (25-10-10)		X				
MT-010-5:2013 Composite Manufacturing Management (30-12-2013)		X				
MT-010-4:2013 Composite Manufacturing Administration (30-12-2013)		X				



	SUB-SECTORS OF THE AEROSPACE INDUSTRY					
Existing Aerospace Industry Sub-Sector/NOSS Job Areas	Maintenance Repair Overhaul (MRO)	Manufacturing	System Integration	Engineering & Design	Continuing Airworthiness Management Organisation (CAMO)	Aerospace Support Services
MT-010-3:2013 Composite Manufacturing Operation (Aerospace) (30-12-2013)		X				
M712-003-3:2017 Penetrant Testing – Aerospace Materials, Components and Structures (13-06-2017)		X				
M712-003-2:2017 Penetrant Testing – Aerospace Materials, Components and Structures (13-06-2017)		X				
M712-003-1:2017 Penetrant Testing – Aerospace Materials, Components and Structures (13-06-2017)		X				
H522-002-5/4:2016 Ground Handling - Ramp Services Management (06-12-2016)						X
TP-078-3:2013 Ground Handling Operation (30-12-2013)						X



<b>SUB-SECTORS OF THE AEROSPACE INDUSTRY</b>						
<b>Existing Aerospace Industry Sub- Sector/NOSS Job Areas</b>	<b>Maintenance Repair Overhaul (MRO)</b>	<b>Manufacturing</b>	<b>System Integration</b>	<b>Engineering &amp; Design</b>	<b>Continuing Airworthiness Management Organisation (CAMO)</b>	<b>Aerospace Support Services</b>
TP-800-3/2/1:2011 Ground Handling- Ramp Services (18-11-11)						X
TP-077-3:2013 In-Flight Services (30-12-2013)						X
TP-804-5:2016 Airport Landside, Terminal & Airside Operations Management (04-02-2016)						X
TP-801-5:2014 Aeronautical Ground Lighting Operations & Maintenance Management (16-12-2014)						X
H522-002-5:2016 Ground Handling - Ramp Services Management (06-12-2016)						X
MC-050-2/3:2015 Machining Operation (24-11-2015)		X				





<b>SUB-SECTORS OF THE AEROSPACE INDUSTRY</b>						
<b>Existing Aerospace Industry Sub- Sector/NOSS Job Areas</b>	<b>Maintenance Repair Overhaul (MRO)</b>	<b>Manufacturing</b>	<b>System Integration</b>	<b>Engineering &amp; Design</b>	<b>Continuing Airworthiness Management Organisation (CAMO)</b>	<b>Aerospace Support Services</b>
MC-050-5:2012 Manufacturing Management (CAD/CAM)		X				
MC-050-4:2012 Manufacturing Coordination (CAD/CAM) (25-10-10)(18-12-2012)		X				
MC-041-5/4/3/2:2012 Industrial Quality Assurance (18-07-2002) (05-04-2012)		X				



Based on further discussion, out of the 35 critical job titles identified, the following NOSS have been highlighted to be reviewed and developed in the near future, to ensure that the curriculum for skills training are aligned to the industry's prevailing and future requirements.

**a) New NOSS to be Developed**

For critical job areas that do not have an existing NOSS developed, the relevant NOSS listed below should be developed according to current industry standards.

- Composite Specialist – Level 6
- Assistant Air Traffic Management Maintenance Engineer– Level 4
- Airworthiness Review Staff (ARS) Specialist – Level 6
- Design Engineer – Level 5
- Quality Assurance Engineer – Level 4/5 (Specific for the Aerospace Industry)
- Assembly Technician – Level 1/2/3 (Specific for the Aerospace Industry)
- Machinist – Level 2 (Specific for the Aerospace Industry)
- B2 Licensed Aircraft Engineer (Type Rated-TR) Avionics – Level 5 (Rotary Wing and Fixed Wing) (It must be noted that although there is the NOSS for Aircraft Maintenance Engineer Avionics, this NOSS is proposed as a new NOSS because the content for this new NOSS will encompass the requirements for both rotary and fixed wing and will also be mapped to DCA requirements)

**b) NOSS to be Reviewed**

The list of NOSS that should be reviewed is as follows:

No	Critical Job Titles	Level	Related Existing NOSS
1)	Aircraft Painting Technician	2	TP-075-2:2012 Aviation Painting (18-12-2012)
2)	Composite Engineer/ Assistant Engineer	4 & 5	MT-010-5/4:2013 Composite Manufacturing Management (30-12-2013)
3)	Composite Technician	3	MT-010-3:2013 Composite Manufacturing Management (30-12-2013)/ TP-076-3:2012 Aircraft Structure Repair-Composite (23-10-12)



### **c) NOSS to be Reviewed (Common under other Industry Lead Body/ Industry Sector)**

Below is the list of NOSS under the different job areas which are common in other industries such as manufacturing, quality inspection and welding so that the NOSS can meet the requirements of the Aerospace Industry:

- MC-062-3 Aerospace Ultrasonic Tester (UT) (25-10-2010)
- TP-074-3/2:2012 Aviation Welding (18-12-2012)
- TP-073-3:2012 Aircraft Structure Repair-Sheet Metal (23-10-2012)
- MC-041-5/4/3/2:2012 Industrial Quality Assurance (05-04-2012)

#### **ii. Embedding Technical, Core and Soft Skills in NOSS**

The skills listed in the Skills in Demand section of this report in Chapter 4 should be embedded in the curriculum of NOSS. This is to bridge technical skills gaps, to ensure the workforce are equipped with emerging skills in demand and to inculcate the soft skills in the workforce so that they are more innovative, specialised, adaptable to change and possess effective communication skills.

#### **iii. Encourage Apprenticeship Training - (National Dual Training System – NDTs)**

Apprenticeship training (National Dual Training System – NDTs) should be implemented for suitable job areas that require intensive hands-on work processes. The NDTs allows trainees to concurrently undergo blocks of theoretical classes and practical training in the actual working environment. This is to address the need to expose potential job candidates to the working environment prior to their job entry.

#### **iv. Accreditation Via Prior Achievement (*Pengiktirafan Pencapaian Terdahulu – PPT*)**

One of the methods of certification by JPK, which is the Accreditation Prior Achievement (*Pengiktirafan Pencapaian Terdahulu – PPT*), should be implemented so that experienced personnel who meet the specified requirements under the PPT programme can be awarded with the relevant Malaysian Skills Certificate (Sijil Kemahiran Malaysia – SKM) by JPK, thus enabling career progression.



### 5.3 CONCLUSION

The conclusion is based on the earlier objectives of the Occupational Framework research and they are elaborated below:

#### **Objective 1: Occupational Structure (OS)**

The occupational analysis conducted has identified 6 main sub-sectors under the Aerospace Industry. There have been 483 job titles identified in the Aerospace Industry Occupational Structure (OS).

#### **Objective 2: Occupational Descriptions (OD)**

The samples of Occupational Descriptions (OD) are included in Annex 4. The OD may serve as reference of job scope and the required competencies for the purpose of NOSS.

#### **Objective 3: Skills in Demand**

Critical Job Titles are identified based on the following in order of importance:

- a) Shortages of skilled workers supply in the industry
- b) Shortages of workers for a particular job area in the industry
- c) Strategic assessment in terms of direction for both short term and long term

The suitability of the job titles to be developed as a NOSS were further discussed in Focus Groups based on the demand for the skilled workers in the near future. A total of 35 Critical Job Titles have been identified.

Below is the list of Critical Job Titles:

**Table 5.2: List of Critical Job Titles**

No	Critical Job Title	Sub-Sector: Job Area	Level
1.	Avionics Manager (Rotary Wing)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics-Rotary Wing)	7
2.	Avionics Foreman (Rotary Wing)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics - Rotary Wing)	6
3.	B2 Licensed Aircraft Engineer (Type Rated- TR) (Avionics- Rotary Wing)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics -Rotary Wing)	5
4.	Avionics Manager (Fixed Wing)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics -Fixed Wing)	7
5.	Avionics Foreman (Fixed Wing)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics-Fixed Wing)	6



No	Critical Job Title	Sub-Sector: Job Area	Level
6.	B2 Licensed Aircraft Engineer (Type Rated-TR) (Avionics - Fixed Wing)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics-Fixed Wing)	5
7.	Sheet Metal Lead	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Sheet Metal)	4
8.	Sheet Metal Supervisor	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Sheet Metal)	3
9.	Sheet Metal Technician	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Sheet Metal)	2
10.	Aircraft Painting Technician	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Aircraft Structure Engineering (Aircraft Painting)	2
11.	NDT Technician (Level III)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (NDT)	4
12.	NDT Technician (Level II)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (NDT)	3
13.	NDT Technician (Level I)	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (NDT)	2
14.	Assistant Communication Maintenance Engineer	Maintenance Repair Overhaul (MRO): Air Traffic System	4
15.	Assistant Navigation Maintenance Engineer	Maintenance Repair Overhaul (MRO): Air Traffic System	4
16.	Assistant Surveillance Maintenance Engineer	Maintenance Repair Overhaul (MRO): Air Traffic System	4
17.	Assistant Air Traffic Management Maintenance Engineer	Maintenance Repair Overhaul (MRO): Air Traffic System	4
18.	Welding Engineer	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Aircraft Welding)/ Aircraft Manufacturing : Aircraft Production (Welding)	5
19.	Assistant Welding Engineer	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Aircraft Welding)/ Aircraft Manufacturing : Aircraft Production (Welding)	4



No	Critical Job Title	Sub-Sector: Job Area	Level
20.	Senior Welding Technician	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Aircraft Welding)/ Aircraft Manufacturing : Aircraft Production (Welding)	3
21.	Welding Technician	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Aircraft Welding)/ Aircraft Manufacturing : Aircraft Production (Welding)	2
22.	Machinist	Aircraft Manufacturing : Aircraft Production (Machining)	2
23.	Composite Specialist	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Composite)	7
24.	Composite Engineer	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Composite)	6
25.	Composite Assistant Engineer	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Composite)	5
26.	Composite Technician	Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Composite)	3
27.	Production Assistant	Aircraft Manufacturing: Aircraft Production Assembly	1
28.	Assembly Technician	Aircraft Manufacturing: Aircraft Production Assembly	2
29.	Senior Assembly Technician	Aircraft Manufacturing: Aircraft Production Assembly	3
30.	QA Engineer	Aerospace Support Services Quality Management / Aircraft Manufacturing: Quality Assurance (QA)	5
31.	QA Assistant Engineer/Quality Inspection Assistant Engineer	Aerospace Support Services Quality Management / Aircraft Manufacturing: Quality Assurance (QA)	4
32.	Design Engineer	Engineering & Design: Engineering Design (Design)	5
33.	Engineering Services Engineer	Continuing Airworthiness Management Organisation (CAMO) Engineering Services (ES)	5
34.	ARS Specialist	CAMO Airworthiness Review Staff (ARS)	6
35.	Technical Support Engineer	Aerospace Support Services (Technical Support Services)	5



## 5.4 MOVING FORWARD

The key to the growth of the Aerospace industry in the midst of a challenging environment is the continuing supply of highly skilled talent who are forward looking, innovative and responsive to change. Up-skilling and reskilling of the current workforce in the skills highlighted in this report is imperative for the industry to remain current and to increase productivity. The new generation of workforce entering the Aerospace Industry should be equipped with knowledge and skills that meet industry requirements. This can be accomplished with a curriculum developed by the industry, for the industry, with training conducted via apprenticeship in the real working environment.

Consolidation or sharing of resources (i.e. equipment, technology expertise and funding) by industry stakeholders is an interesting option of ensuring the provision of skills training that is equipped with state of the art technology, current technological know-how and exposure to real working environments via hands-on training.

It is envisaged that this research will be able to assist those in the industry to make informed decisions concerning human capital development based on input from the industry regarding manpower requirements such as career paths, skills in demand, jobs in demand and emerging skills. In order to become a developed nation, the country has to put more emphasis on job creation and skills training for highly skilled jobs such as in the Aerospace Industry.



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**ANNEX 1**

**MOSQF LEVEL DESCRIPTORS**



**MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF)  
LEVEL DESCRIPTOR**

LEVEL	LEVEL DESCRIPTION
1	Competent in performing a range of varied work activities, most of which are <b>routine and predictable</b> .
2	Competent in performing <b>a significant range of varied work activities</b> , performed in a variety of context. Some of the <b>activities are non-routine</b> and required individual responsibility and autonomy.
3	Competent in performing <b>a broad range of varied work activities</b> , performed in a variety of context, most of which are <b>complex and non-routine</b> . There is considerable responsibility and autonomy and <b>control or guidance of others</b> is often required.
4	Competent in performing <b>a broad range of complex technical or professional work</b> activities carried out in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and allocation of resources is often present. <b>Higher level of technical skills</b> should be demonstrated.
5	Competent in applying a significant range of <b>fundamental principles and complex techniques across</b> a wide and often unpredictable variety of contexts. Very <b>substantial personal autonomy</b> and often significant responsibility for the work of others and for the allocation of substantial resources feature strongly, as do personal accountabilities for <b>analysis and diagnosis, design, planning, execution and evaluation</b> . Specialisation of technical skills should be demonstrated.
6	Achievement at this level reflects the ability to <b>refine</b> and use relevant understanding, methods and skills to address <b>complex problems that have limited definition</b> . It includes taking responsibility for planning and developing courses of action <b>that are able to underpin substantial change or development, as well as exercising broad autonomy and judgment</b> . It also reflects an understanding of different perspectives, <b>approaches of schools of thought and the theories that underpin them</b>
7	Achievement at this level reflects the ability to <b>reformulate</b> and use relevant understanding, methodologies and approaches to address <b>problematic situations</b> that involve many interacting factors. It includes taking responsibility for <b>planning and developing</b> courses of action that initiate or underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding <b>of theoretical and relevant methodological perspectives, and how they affect their sub-area of study or work</b>
8	Achievement at this level reflects the <b>ability to develop original understanding</b> and extend a sub-area of knowledge or professional practice. It reflects the ability to address problematic situations that involve many complexes, interacting factors through initiating, designing and undertaking research, development or strategic activities. It involves the exercise of broad autonomy, judgement and leadership in sharing responsibility for the development of a field of work or knowledge, or for creating substantial professional or organisational change. It also reflects a critical understanding of relevant theoretical and methodological perspectives and how they affect the field of knowledge or work.



**ANNEX 2**

**LIST OF CONTRIBUTORS**



**LIST OF OCCUPATIONAL FRAMEWORK TECHNICAL EVALUATION PANEL MEMBERS  
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7	Mr. Syed Othman Bin Abdul Rahman	Chief Operating Officer	Airod Aerospace Technology Sdn. Bhd.
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9	Mr. Sudriman Bin Hassan	Manager, Engineering Services & Design Office	Airbus Helicopters Malaysia Sdn. Bhd.



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3.	Ms. Hairul Nishak Binti Ahmad	Senior Assistant Director, Strategic Partnership Division (Industry Lead Body) Department of Skills Development, Ministry of Human Resources.
4.	Mr. Razalee Bin Che Ros	Senior Skills Development Officer, NOSS Division, Department of Skills Development, Ministry of Human Resources.

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3.	Mr. Ahmad Ramdan Bin M Yusof	Co-Facilitator/ Documenter, Professional & Technical Academy Sdn. Bhd.
4.	Ms. Roslina Binti Ismail	Documenter/Secretariat, Professional & Technical Academy Sdn. Bhd.
5.	Mr. Manjit Singh	Proof Reader, Dovemaps Sdn. Bhd.

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<b>NO.</b>	<b>GOVERNMENT AGENCY/ COMPANY</b>
1.	Department of Civil Aviation Malaysia
2.	Majlis Amanah Rakyat
3.	Talent Corporation Malaysia Berhad
4.	Advanced Air Traffic Systems (M) Sdn. Bhd.
5.	Aerospace Malaysia Innovation Centre
6.	Aerotree Defence & Services Sdn. Bhd.
7.	Aerospace Composites Malaysia Sdn. Bhd.
8..	Airbus Group (Malaysia) Sdn. Bhd.
9.	Airbus Helicopters Malaysia Sdn. Bhd.
10.	Airbus Customer Services Sdn, Bhd.
11.	Airod Aerospace Technology Sdn. Bhd.
12.	Airod Techno Power Sdn. Bhd.
13.	APR-Aviation Training Centre Sdn. Bhd.
14.	Asia AeroTechnic Sdn. Bhd.
15.	Astronautic Technology (M) Sdn. Bhd.



NO.	GOVERNMENT AGENCY/ COMPANY
16.	Aviation Design Centre Sdn. Bhd.
17.	Celestica Malaysia Sdn. Bhd.
18.	CTRM Aero Composites Sdn. Bhd.
19.	GE Engine Services Malaysia Sdn. Bhd.
20.	German-Malaysian Institute
21.	Hamilton Sundstrand Customer Support Centre (M) Sdn. Bhd.
22.	Innopeak (M) Sdn. Bhd.
23.	KIRD Enterprise
24.	Luftaero Supply
25.	Mawea Industries Sdn. Bhd.
26.	Mycopter Aviation Services Sdn. Bhd.
27.	National Aerospace & Defence Industries Sdn. Bhd.
28.	Paragon Nexus Sdn. Bhd.
29.	RUAG Aviation Malaysia Sdn. Bhd.
30.	Sepang Aircraft Engineering Sdn. Bhd.
31.	Spirit Aerosystems Malaysia Sdn. Bhd.
32.	SR Aviation Sdn. Bhd.
33.	STRAND Aerospace Malaysia Sdn. Bhd
34.	UMW Aerospace Sdn. Bhd.
35.	Universal Aero Solutions
36.	UTC Aerospace Systems
37.	Zetro Aerospace Corporation Sdn. Bhd.





# **ANNEX 3**

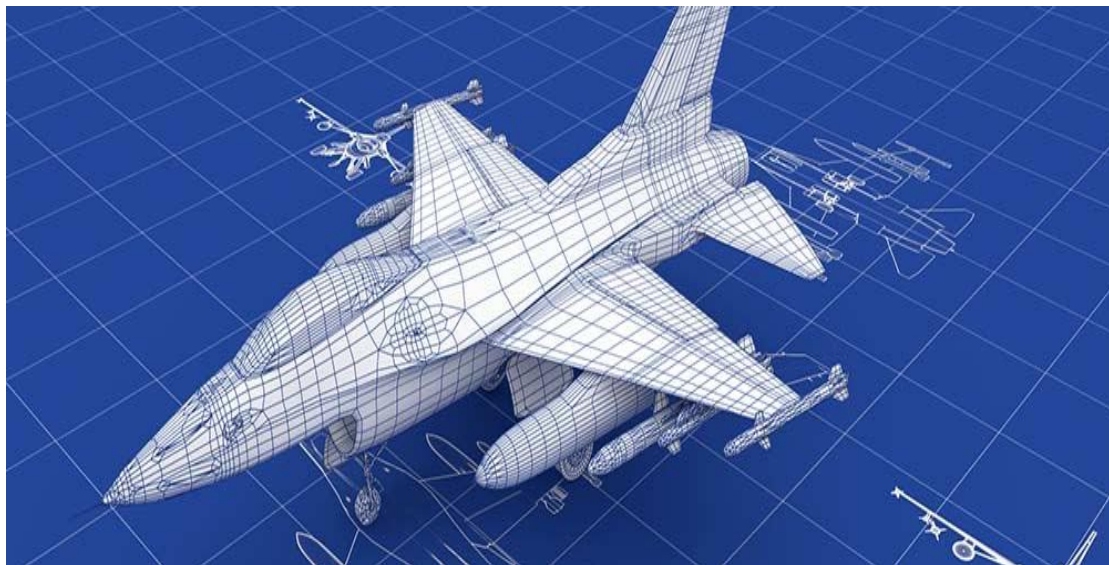
## **QUESTIONNAIRE**





# OCCUPATIONAL FRAMEWORK DEVELOPMENT OF THE AEROSPACE INDUSTRY

DEPARTMENT OF SKILLS DEVELOPMENT  
MINISTRY OF HUMAN RESOURCES  
AND  
NATIONAL AEROSPACE INDUSTRY COORDINATING  
OFFICE (NAICO)  
MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY



## AEROSPACE INDUSTRY OCCUPATIONAL FRAMEWORK SURVEY



**AEROSPACE INDUSTRY  
OCCUPATIONAL FRAMEWORK SURVEY**

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*Salam 1 Malaysia*

In collaboration with the Department of Skills Development (DSD), Ministry of Human Resources and National Aerospace Industry Coordinating Office (NAICO), Ministry of Industry and Trade International, the researcher is currently conducting an analysis on the Occupational Framework of the Aerospace Industry. From this analysis, the industry framework, occupational structure, occupational job titles, and job description will be summarised for the use of the Government, private sector, investors, employers, employees, educators or any personnel involved either directly or indirectly with this industry.

The main objective of this research is to enhance skills training starting from the entry level position for any job in this industry based on input from the industry. It will also provide a reference competency for skills required by workers to perform as required in the industry.

This survey will be used as field data in order to conduct a comprehensive analysis of the Occupational Framework in the industry. The target group for this survey is the organisation's representative either from the Human Resource Department or personnel at Management level.

Please provide comment(s) and answer(s) as required in the sections of this survey form. There are four (4) sections, which are:-

- (1): Occupational Structure of the Aerospace Industry
- (2): Job(s) In Demand
- (3): Skills Gap
- (4): Emerging Skills

We would like to extend our heartfelt gratitude upon your cooperation in answering this survey. Please fill in where necessary in the forms provided. Do advise us if you wish to remain anonymous in your survey response. There will be further communication with survey respondents in order to verify our findings.

(Researcher: Dr. Amiron Ismail: pritec\_academy@yahoo.com)

**Survey Respondent Details**

Name : \_\_\_\_\_

Position : \_\_\_\_\_

Organisation : \_\_\_\_\_

Industry Sub-Sector: MRO / Manufacturing / Design & Engineering /Systems Integration/  
Aerospace Support Services / Others \_\_\_\_\_  
*(Please select your organisation's sub-sector)*



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### **IMPORTANT NOTE**

*The job areas stated in this questionnaire do not include the common job areas available in other industries such as below*

- *IT*
- *Human Resource*
- *Accounts and Finance*

*The other job areas can be found in the related industry sectors. For example, IT job areas are listed in the ICT Industry Sector. This survey is targeted for jobs unique to this Industry.*

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## SECTION 1: OCCUPATIONAL STRUCTURE OF THE AEROSPACE INDUSTRY

Please refer to Table A1 to Table A17 below for the **Occupational Structure of Aerospace Industry** proposed by the Occupational Framework Development (OF) Focus Group.

Please note that:-

- a) Table A 1 to Table A 6 : **Sub-Sectors and Job Areas without** the Job Titles and Levels.
- b) Table A 7 to Table A 17 : **Job Titles and Levels** (Level 1 to 8) of the respective Sub-Sectors of Table A1 to A6

Q (1.1) With reference to Table A1 – A6, kindly provide your comments in the space below, on the Occupational Areas shown in Tables A1 to A6 in terms of grouping, naming or suitability to the Aerospace industry.

Q (1.2) With reference to Table A7 – A17, please comment the job titles of the respective job areas.





**Table A1: Sub-sectors / Job Areas / Sub-Areas of Maintenance, Repair and Overhaul (MRO)**

<b>MSIC Section</b>	<b>C – MANUFACTURING</b>																																	
<b>MSIC Division</b>	<b>33 – REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT</b>																																	
<b>Sub Sector</b>	<b>MAINTENANCE REPAIR OVERHAUL (MRO)</b>																																	
<b>Job Area</b>	<b>AIRCRAFT MAINTENANCE</b>																																	
<b>Sub Area</b>	<b>Rotary Wing</b>			<b>Fixed Wing</b>			<b>Aircraft Structure Engineering</b>						<b>Avionic</b>					<b>Mechanical</b>																
	Airframe	Piston Engine	Turbine Engine	Avionic	Airframe	Piston Engine	Turbine Engine	Avionic	Sheet Metal	Galley	Flight Control Balancing	Composite	Non Destructive Testing (NDT)	Aircraft Painting	Aircraft Welding	Technical Services	Electrical	Electronic	Instrument	Auto Pilot	Navigation	Radar	Radio	Cabin Interior	Hydraulic	Oxygen	Pneumatic	Aircraft Components	Air-Conditioning	Landing Gear	Electroplating	Fuel Tank	Engine Bay (Turbine/Piston)	Upholstery

<b>MSIC Section</b>	<b>C – MANUFACTURING</b>												
<b>MSIC Division</b>	<b>33 – REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT</b>												
<b>Sub Sector</b>	<b>MAINTENANCE REPAIR OVERHAUL (MRO)</b>												
<b>Job Area</b>	<b>AIRCRAFT UPGRADE &amp; MODIFICATION</b>						<b>AIR TRAFFIC SYSTEM</b>					<b>Equipment-Calibration</b>	<b>Flight Simulator</b>
<b>Sub Area</b>	<b>Modification</b>	<b>Aircraft Conversion</b>			<b>Remanufacturing</b>		<b>Communication</b>	<b>Navigation</b>	<b>Surveillance</b>	<b>Air Traffic Management</b>	<b>Depot Repairing</b>		
	Aircraft Structure (Metal/Composite)	Aircraft Design	Aircraft Assembly	Aircraft Machining	Aircraft	Components							



**Table A2: Sub-sectors / Job Areas / Sub-Areas of Manufacturing**

<b>MSIC Section</b>	<b>C – MANUFACTURING</b>										
<b>MSIC Division</b>	<b>28 - MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C (NOT ELSEWHERE CLASSIFIED)</b>										
<b>Sub Sector</b>	<b>MANUFACTURING</b>										
<b>Job Area</b>	<b>PRODUCTION</b>					<b>QUALITY</b>			<b>ENGINEERING</b>		
<b>Sub Area</b>	<b>Welding</b>	<b>Machining</b>	<b>Laminating</b>	<b>Production Planning</b>	<b>Mechanical Assembly</b>	<b>Quality Assurance (QA)</b>	<b>NDT</b>	<b>Inspection</b>	<b>Tooling</b>	<b>CAD/CAM</b>	<b>Process Control</b>

**Table A3: Sub-sectors / Job Areas of System Integration**

<b>MSIC Section</b>	<b>M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES</b>				
<b>MSIC Division</b>	<b>71 - TECHNICAL TESTING AND ANALYSIS</b>				
<b>Sub Sector</b>	<b>SYSTEM INTEGRATION</b>				
<b>Job Area</b>	<b>SYSTEM PROGRAMMING (SP)</b>	<b>SYSTEM ANALYST (SA)</b>	<b>NETWORK ARCHITECT (NA)</b>	<b>NETWORK SAFETY (NS)</b>	<b>SYSTEM ARCHITECTURE (SAR)</b>





**Table A4 : Sub-sectors / Job Areas / Sub-Areas of Engineering & Design**

<b>MSIC Section</b>	<b>M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES</b>													
<b>MSIC Division</b>	<b>71 - TECHNICAL TESTING AND ANALYSIS</b>													
<b>Sub Sector</b>	<b>ENGINEERING &amp; DESIGN</b>													
<b>Job Area</b>	<b>ENGINEERING DESIGN</b>		<b>STRUCTURAL ENGINEERING</b>		<b>TOOLING DESIGN</b>	<b>TECHNICAL SERVICES</b>					<b>PRODUCT R&amp;D</b>			
<b>Sub Area</b>	Product Configuration	Design	Stress (Metallic and Composite)	Fatigue & Damaged Tolerance (F&DT)	Tooling (Metallic & Composite)	Compliance	Electrical Services	Mechanical Services	Structure Services	Power Plant	Avionics	Structural	Process	Product

**Table A 5: Sub-sectors / Job Areas of Continuing Airworthiness Management Organisation (CAMO)**

<b>MSIC SECTION</b>	<b>M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES</b>			
<b>MSIC DIVISION</b>	<b>71 - TECHNICAL TESTING AND ANALYSIS</b>			
<b>SUB SECTOR</b>	<b>CONTINUING AIRWORTHINESS MANAGEMENT ORGANISATION (CAMO)</b>			
<b>Job Area</b>	<b>ENGINEERING SERVICES (ES)</b>	<b>QUALITY</b>	<b>PLANNING</b>	<b>TECHNICAL PUBLICATION &amp; RECORD</b>

**Table A 6: Sub-sectors / Job Areas of Aerospace Support Services**

<b>MSIC Section</b>	<b>H - TRANSPORTATION &amp; STORAGE</b>				
<b>MSIC Division</b>	<b>51 - AIR TRANSPORT</b>				
<b>Sub Sector</b>	<b>AEROSPACE SUPPORT SERVICES</b>				
<b>Job Area</b>	<b>TECHNICAL SUPPORT SERVICES</b>	<b>GROUND HANDLING</b>	<b>GROUND EQUIPMENT SUPPORT</b>	<b>SUPPLY CHAIN MANAGEMENT (SCM)</b>	<b>QUALITY MANAGEMENT</b>



**Table A 7: Job Titles: Aircraft Maintenance – Rotary & Fixed Wing**

MSIC Section	C - MANUFACTURING							
MSIC Division	33 - REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT							
Sub Sector	MAINTENANCE REPAIR OVERHAUL (MRO)							
Job Area	AIRCRAFT MAINTENANCE							
Sub Area	Rotary Wing				Fixed Wing			
	Airframe	Piston Engine	Turbine Engine	Avionic	Airframe	Piston Engine	Turbine Engine	Avionic
Level								
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	Airframe Superintendent (Rotary Wing)	Piston Engine Superintendent (Rotary Wing)	Turbine Engine Superintendent (Rotary Wing)	Avionic Superintendent (Rotary Wing)	Airframe Superintendent (Fixed Wing)	Piston Engine Superintendent (Fixed Wing)	Turbine Engine Superintendent (Fixed Wing)	Avionic Superintendent (Fixed Wing)
6	Airframe Foreman (Rotary Wing)	Piston Engine Foreman (Rotary Wing)	Turbine Engine Foreman (Rotary Wing)	Avionics Foreman (Rotary Wing)	Airframe Foreman (Fixed Wing)	Piston Engine Foreman (Fixed Wing)	Turbine Engine Foreman (Fixed Wing)	Avionics Foreman (Fixed Wing)
5	Airframe Licensed Aircraft Engineer (LAE) (Type Rating) (Rotary Wing)	Piston Engine Licensed Aircraft Engineer (LAE) (Type Rating) (Rotary Wing)*	Turbine Engine Licensed Aircraft Engineer (LAE) (Type Rating) (Rotary Wing)*	Avionic Licensed Aircraft Engineer (LAE) (Type Rating) (Rotary Wing)	Airframe Licensed Aircraft Engineer (LAE) (Type Rating) (Fixed Wing)	Piston Engine Licensed Aircraft Engineer (LAE) (Type Rating) (Fixed Wing)*	Turbine Engine Licensed Aircraft Engineer (LAE) (Type Rating) (Fixed Wing)*	Avionic Licensed Aircraft Engineer (LAE) (Type Rating) (Fixed Wing)
4	Airframe Licensed Aircraft Engineer (LAE) (Without Rating) (Rotary Wing)	Piston Engine Licensed Aircraft Engineer (LAE) (Without Rating) (Rotary Wing)*	Turbine Engine Licensed Aircraft Engineer (LAE) (Without Rating) (Rotary Wing)*	Avionic Licensed Aircraft Engineer (LAE) (Without Rating) (Rotary Wing)	Airframe Licensed Aircraft Engineer (LAE) (Without Rating) (Fixed Wing)	Piston Engine Licensed Aircraft Engineer (LAE) (Without Rating) (Fixed Wing)*	Turbine Engine Licensed Aircraft Engineer (LAE) (Without Rating) (Fixed Wing)*	Avionic Licensed Aircraft Engineer (LAE) (Without Rating) (Fixed Wing)
3	Airframe Supervisor (Rotary Wing)	Piston Engine Supervisor (Rotary Wing)	Turbine Engine Supervisor (Rotary Wing)	Avionic Supervisor (Rotary Wing)	Airframe Supervisor (Fixed Wing)	Piston Engine Supervisor (Fixed Wing)	Turbine Engine Supervisor (Fixed Wing)	Avionic Supervisor (Fixed Wing)
2	Airframe Technician (Rotary Wing)	Piston Engine Technician (Rotary Wing)*	Turbine Engine Technician (Rotary Wing)*	Avionic Technician (Rotary Wing)	Airframe Technician (Fixed Wing)	Piston Engine Technician (Fixed Wing)*	Turbine Engine Technician (Fixed Wing)*	Avionic Technician (Fixed Wing)
1	Airframe Mechanic (Rotary Wing)	Piston Engine Mechanic (Rotary Wing)*	Turbine Engine Mechanic (Rotary Wing)	Avionic Mechanic (Rotary Wing)	Airframe Mechanic (Fixed Wing)	Piston Engine Mechanic (Fixed Wing)*	Turbine Engine Mechanic (Fixed Wing)	Avionic Mechanic (Fixed Wing)



**Table A 8(i): Job Titles: Aircraft Maintenance -- Aircraft Structure Engineering**

MSIC Section	C – MANUFACTURING							
MSIC Division	33 - REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT							
Sub Sector	MAINTENANCE REPAIR OVERHAUL (MRO)							
Job Area	AIRCRAFT MAINTENANCE							
Sub Area/Level	Aircraft Structure Engineering							
	Sheet Metal	Galley	Flight Control Balancing	Composite	Non Destructive Testing (NDT)	Aircraft Painting	Aircraft Welding	Technical Services
8	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
7	Sheet Metal Superintendent	Galley Superintendent	Flight Control Superintendent	Composite Superintendent	NDT Superintendent	Painting Superintendent	Welding Superintendent	Technical Services Superintendent
6	Sheet Metal Foreman	Galley Foreman	Flight Control Foreman	Composite Foreman	NDT Foreman	Painting Foreman	Welding Foreman	Technical Services Foreman
5	Sheet Metal Specialist	Galley Specialist	Flight Control Balancing Specialist	Composite Specialist	NDT Engineer	Painting Specialist	Welding Specialist	Senior Technical Services Engineer
4	Sheet Metal Engineer	Galley Engineer	Flight Control Balancing Engineer	Composite Engineer	NDT Planner	Painting Inspector	Welding Inspector	Technical Services Engineer
3	Sheet Metal Supervisor*	Galley Supervisor*	Flight Control Balancing Supervisor	Composite Supervisor	NDT Inspector (Level III)	Painting Supervisor	Welding Supervisor	Technical Services Officer
2	Sheet Metal Technician*	Galley Technician	Flight Control Balancing Technician	Composite Technician	NDT Technician (Level II)	Painting Technician	Welding Technician	<i>No Level</i>
1	Sheet Metal Mechanic*	Galley Mechanic	Flight Control Balancing Mechanic	Composite Mechanic	NDT Assistant Technician (Level I)	Assistant Painting	Assistant Welding	<i>No Level</i>



**Table A 8(ii): Job Titles: Aircraft Maintenance - Avionics**

<b>MSIC Section</b>	<b>C - MANUFACTURING</b>						
<b>MSIC Division</b>	<b>33 - REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT</b>						
<b>Sub Sector</b>	<b>MAINTENANCE REPAIR OVERHAUL (MRO)</b>						
<b>Job Area</b>	<b>AIRCRAFT MAINTENANCE</b>						
<b>Sub Area/Level</b>	<b>Avionic</b>						
	<b>Electrical</b>	<b>Electronic</b>	<b>Instrument</b>	<b>Auto Pilot</b>	<b>Navigation</b>	<b>Radar</b>	<b>Radio</b>
<b>8</b>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
<b>7</b>	Electrical Superintendent	Electronic Superintendent	Instrument Superintendent	Auto Pilot Superintendent	Navigation Superintendent	Radar Superintendent	Radio Superintendent
<b>6</b>	Electrical Foreman	Electronic Foreman	Instrument Foreman	Auto Pilot Foreman	Navigation Foreman	Radar Foreman	Radio Foreman
<b>5</b>	Electrical Specialist	Electronic Specialist	Instrument Specialist	Auto Pilot Specialist	Navigation Specialist	Radar Specialist	Radio Specialist
<b>4</b>	Electrical Engineer	Electronic Engineer	Instrument Engineer	Auto Pilot Engineer	Navigation Engineer	Radar Engineer	Radio Engineer
<b>3</b>	Electrical Supervisor	Electronic Supervisor	Instrument Supervisor	Auto Pilot Supervisor	Navigation Supervisor	Radar Supervisor	Radio Supervisor
<b>2</b>	Electrical Technician	Electronic Technician	Instrument Technician	Auto Pilot Technician	Navigation Technician	Radar Technician	Radio Technician
<b>1</b>	Electrical Mechanic	Electronic Mechanic	Instrument Mechanic	Auto Pilot Mechanic	Navigation Mechanic	Radar Mechanic	Radio Mechanic



**Table A 8(iii): Job Titles: Aircraft Maintenance – Equipment Calibration & Flight Simulator**

<b>MSIC Section</b>	<b>C - MANUFACTURING</b>	
<b>MSIC Division</b>	<b>33 - REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT</b>	
<b>Sub Sector</b>	<b>MAINTENANCE REPAIR OVERHAUL (MRO)</b>	
<b>Job Area</b>	<b>AIRCRAFT MAINTENANCE</b>	
<b>Sub Area/Level</b>	<b>Equipment Calibration</b>	<b>Flight Simulator</b>
<b>8</b>	<i>No Level</i>	<i>No Level</i>
<b>7</b>	Calibration Testing Analysis Superintendent	Flight Simulator Superintendent
<b>6</b>	Calibration Testing Analysis Foremen	Flight Simulator Designer
<b>5</b>	Calibration Testing Analysis Specialist	Flight Simulator Specialist
<b>4</b>	Calibration Testing Analysis Engineer	Flight Simulator Engineer
<b>3</b>	Calibration Testing Analysis Supervisor	Flight Simulator Supervisor
<b>2</b>	Calibration Testing Technician	Flight Simulator Technician
<b>1</b>	Calibration Testing Mechanic	<i>No Level</i>



Table A 8(iv): Job Titles: Mechanical Aircraft Engineering

MSIC Section	C - MANUFACTURING											
MSIC Division	33 - REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT											
Sub Sector	MAINTENANCE REPAIR OVERHAUL (MRO)											
Job Area	AIRCRAFT MAINTENANCE											
Sub Area/ Level	Mechanical											
	Cabin Interior	Hydraulic	Oxygen	Pneumatic	Aircraft Components	Air-Conditioning	Landing Gear	Electroplating	Fuel Tank	Engine Bay (Turbine/ Piston)	Upholstery	Weigh & Balance
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	Cabin Interior Superintendent	Hydraulic Superintendent	Oxygen Superintendent	Pneumatic Superintendent	Aircraft Components Superintendent	Air-Conditioning Superintendent	Landing Gear Superintendent	Electroplating Superintendent	Fuel Tank Superintendent	Engine Superintendent	Upholstery Superintendent	Weigh & Balance Superintendent
6	Cabin Interior Foreman	Hydraulic Foreman	Oxygen Foreman	Pneumatic Foreman	Aircraft Components Foreman	Air-Conditioning Foreman	Landing Gear Foreman	Electroplating Foreman	Fuel Tank Foreman	Engine Foreman	Upholstery Foreman	Weigh & Balance Foreman
5	Cabin Interior Specialist	Hydraulic Specialist	Oxygen Specialist	Pneumatic Specialist	Aircraft Components Specialist	Air-Conditioning Specialist	Landing Gear Specialist	Electroplating Specialist	Fuel Tank Specialist	Engine Analysis and Testing Specialist	Upholstery Specialist Fabricator	Weigh & Balance Specialist
4	Cabin Interior Engineer	Hydraulic Engineer	Oxygen Engineer	Pneumatic Engineer	Aircraft Components Engineer	Air-Conditioning Engineer	Landing Gear Engineer	Electroplating Engineer	Fuel Tank Engineer	Engine Overhaul Engineer	Upholstery Designer	Weigh & Balance Engineer
3	Cabin Interior Supervisor	Hydraulic Supervisor	Oxygen Supervisor	Pneumatic Supervisor	Aircraft Components Supervisor	Air-Conditioning Supervisor	Landing Gear Supervisor	Electroplating Supervisor	Fuel Tank Supervisor	Engine Supervisor	Upholstery Supervisor	Weigh & Balance Supervisor
2	Cabin Interior Technician	Hydraulic Technician	Oxygen Technician	Pneumatic Technician	Aircraft Components Technician	Air-Conditioning Technician	Landing Gear Technician	Electroplating Technician	Fuel Tank Technician	Engine Technician	Upholstery Fabricator	Weigh & Balance Technician
1	Cabin Interior Mechanic	Hydraulic Mechanic	Oxygen Mechanic	Pneumatic Mechanic	Aircraft Components Mechanic	Air-Conditioning Mechanic	Landing Gear Mechanic	Electroplating Mechanic	Fuel Tank Mechanic	Engine Mechanic	Upholstery Tailor	Weigh & Balance Mechanic



**Table A 9: Job Titles: Aircraft Upgrade & Modification**

MSIC Section	C - MANUFACTURING					
MSIC Division	33 - REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT					
Sub Sector	MAINTENANCE REPAIR OVERHAUL (MRO)					
Job Area	AIRCRAFT UPGRADE & MODIFICATION					
Sub Area/Level	Modification	Aircraft Conversion			Remanufacturing	
	Aircraft Structure (Metal/Composite)	Aircraft Design	Aircraft Assembly	Aircraft Machining	Aircraft	Components
8	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
7	Aircraft Structure Superintendent	Designer Analysis Superintendent	Assembler Superintendent	Machinist Superintendent	Aircraft Remanufacturing Superintendent	Components Remanufacturing Superintendent
6	Aircraft Structure Specialist*	Designer Analysis Specialist	Assembler Specialist	Machinist Specialist	Aircraft Remanufacturing Specialist	Components Remanufacturing Specialist
5	Aircraft Structure Senior Engineer	Designer Analysis and Testing Engineer	Assembler Engineer	Machinist Engineer	Aircraft Remanufacturing Engineer	Components Remanufacturing Engineer
4	Aircraft Structure Engineer*	Testing Designer	Assembler Tester	Machinist Supervisor	Aircraft Remanufacturing Supervisor	Components Remanufacturing Supervisor
3	Aircraft Structure Supervisor	Drafter	Assembler Supervisor	Machinist Technician	Aircraft Remanufacturing Technician	Components Remanufacturing Technician
2	Aircraft Structure Technician*	<i>No Level</i>	Assembler Operator	Machinist Operator	Aircraft Remanufacturing Operator	Components Remanufacturing Operator
1	Aircraft Structure Mechanic*	<i>No Level</i>	Assembler	Machinist	<i>No Level</i>	<i>No Level</i>



**Table A 10: Job Titles: Air Traffic System**

Section	C - MANUFACTURING				
Division	33 - REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT				
Sub Sector	MAINTENANCE REPAIR OVERHAUL (MRO)				
Job Area	AIR TRAFFIC SYSTEM				
Sub Area Level	Communication	Navigation	Surveillance	Air Traffic Management	Depot Repairing
8	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
7	Communication Specialist	Navigation Specialist	Surveillance Specialist	Air Traffic Management Specialist	Depot Repairing Specialist
6	Assistant Communication Specialist	Assistant Navigation Specialist	Assistant Surveillance Specialist	Assistant Air Traffic Management Specialist	Assistant Depot Repairing Specialist
5	Communication Maintenance Engineer (Engineer)	Navigation Maintenance Engineer (Engineer)	Surveillance Maintenance Engineer (Engineer)	Air Traffic Management Maintenance Engineer (Engineer)	Depot Repairing Maintenance Engineer (Engineer)
4	Assistant Communication Maintenance Technologist	Assistant Navigation Maintenance Technologist	Assistant Surveillance Maintenance Technologist	Assistant Air Traffic Management Maintenance Technologist	Assistant Depot Repairing Maintenance Technologist
3	Senior Communication Technician	Senior Navigation Technician	Senior Surveillance Technician	Senior Air Traffic Management Technician	Senior Depot Repairing Technician
2	Communication Technician	Navigation Technician	Surveillance Technician	Air Traffic Management Technician	Depot Repairing Technician
1	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>





**Table A 11: Job Titles: Production of the Sub Sector Manufacturing**

<b>MSIC Section</b>	<b>C - MANUFACTURING</b>				
<b>MSIC Division</b>	<b>28 - MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.</b>				
<b>Sub Sector</b>	<b>MANUFACTURING</b>				
<b>Job Area</b>	<b>PRODUCTION</b>				
<b>Sub Area Level</b>	<b>Welding</b>	<b>Machining</b>	<b>Laminating</b>	<b>Production Planning</b>	<b>Mechanical Assembly</b>
<b>8</b>	Welding Manager	Machining Manager	Laminating Manager	Planning Manager	Production Manager
<b>7</b>	Assistant Welding Manager	Assistant Machining Manager	Assistant Laminating Manager	Assistant Planning Manager	Assistant Production Manager
<b>6</b>	Welding Specialist	Machining Specialist	Laminating Specialist	Planning Specialist	Production Specialist
<b>5</b>	Welding Technologist	Machining Engineer	Laminating Engineer	Planning Engineer	Production Engineer
<b>4</b>	Assistant Welding Engineer	Assistant Machining Engineer	Assistant Laminating Engineer	Assistant Planning Engineer	Assistant Production Engineer
<b>3</b>	Senior Welding Technician	Senior Machinist	Senior Laminating Technician	Senior Planning Technician	Senior Production Technician
<b>2</b>	Welding Technician	Machinist	Laminating Technician	Planning Technician	Production Technician
<b>1</b>	Production Assistant	Production Assistant	Production Assistant	Production Assistant	Production Assistant



**Table A 12: Job Titles: Quality and Engineering**

MSIC Section	C - MANUFACTURING					
MSIC Division	28 - MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.					
Sub Sector	MANUFACTURING					
Job Area	Quality			Engineering		
Sub Area Level	Quality Assurance (QA)	NDT	Inspection	Tooling	CAD/CAM	Process Control
8	No Level	No Level	No Level	No Level	No Level	No Level
7	QA Specialist	No Level	No Level	Tool & Design Specialist	CAD/CAM Specialist	Process Control Specialist
6	Assistant QA Specialist	Senior NDT Engineer	Senior Quality Inspection Engineer	Assistant Tool & Design Specialist	Assistant CAD/CAM Specialist	Assistant Process Control Specialist
5	QA Engineer	NDT Engineer	Quality Inspection Engineer	Tool & Design Engineer	CAD/CAM Engineer	Process Control Engineer
4	No Level	Assistant NDT Engineer	Assistant Quality Inspection Engineer	Assistant Tool & Design Technologist	No Level	No Level
3	No Level	Senior NDT Technician	Senior Quality Inspector	Senior Tooling Technician	No Level	No Level
2	No Level	NDT Technician	Quality Inspector	Tooling Technician	No Level	No Level
1	No Level	No Level	No Level	No Level	No Level	No Level



**Table A 13: Job Titles: Systems Integration**

MSIC Section	M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES				
MSIC Division	71 - TECHNICAL TESTING AND ANALYSIS				
Sub Sector	SYSTEM INTEGRATION				
Job Area	SYSTEM PROGRAMMING (SP)	SYSTEM ANALYST (SA)	NETWORK ARCHITECT (NA)	NETWORK SAFETY (NS)	System Architecture (SAr)
Sub Area Level					
8	No Level	No Level	No Level	No Level	No Level
7	SP Specialist	SA Specialist	NA Specialist	NS Specialist	SAr Specialist
6	Assistant SP Specialist	Assistant SA Specialist	Assistant NA Specialist	Assistant NS Specialist	Assistant SAr Specialist
5	SP Technologist	SA Technologist	NA Technologist	NS Technologist	SAr Technologist
4	Assistant SP Technologist	Assistant SA Technologist	Assistant NA Technologist	Assistant NS Technologist	Assistant SAr Technologist
3	No Level	No Level	No Level	No Level	No Level
2	No Level	No Level	No Level	No Level	No Level
1	No Level	No Level	No Level	No Level	No Level



**Table A 14: Job Titles: Engineering Design, Structural Engineering and Tooling Design**

MSIC Section	M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES				
MSIC Division	71 - TECHNICAL TESTING AND ANALYSIS				
Sub Sector	ENGINEERING & DESIGN				
Job Area	ENGINEERING DESIGN		STRUCTURAL ENGINEERING		TOOLING DESIGN
Sub Area Level	Product Configuration	Design	Stress (Metallic and Composite)	Fatigue & Damaged Tolerance (F&DT)	Tooling (Metallic and Composite)
8	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
7	Principal Product Configuration Technologist	Principal Design Technologist	Principal Stress Technologist	Principal F&DT Technologist	Principal Tooling Technologist
6	Senior Product Configuration Technologist	Senior Design Technologist	Senior Stress Technologist	Senior F&DT Technologist	Senior Tooling Technologist
5	Product Configuration Technologist	Design Technologist	Stress Technologist	F&DT Technologist	Tooling Technologist
4	<i>No Level</i>	Drafter	<i>No Level</i>	<i>No Level</i>	Drafter
3	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
2	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
1	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>



**Table A 15: Job Titles: Technical Services and Product R&D**

MSIC Section	M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES							
MSIC Division	71 - TECHNICAL TESTING AND ANALYSIS							
Sub Sector	ENGINEERING & DESIGN							
Job Area	TECHNICAL SERVICES					PRODUCT R&D		
Sub Area Level	Compliance	Electrical Services	Structure Services	Power Plant	Avionics	Structural Improvement	Process Improvement	Product Improvement
8	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
7	Principal Compliance Technologist	Principal Electrical Services Technologist	Principal Structure Services Technologist	Principal Power Plant Technologist	Principal Avionics Technologist	Principal Structural Improvement Technologist	Process Structural Improvement Technologist	Process Product Improvement Technologist
6	Senior Compliance Technologist	Senior Electrical Services Technologist	Senior Structure Services Technologist	Senior Power Plant Technologist	Senior Avionics Technologist	Senior Structural Improvement Technologist	Senior Process Improvement Technologist	Senior Product Improvement Technologist
5	Compliance Technologist	Electrical Services Technologist	Structure Services Technologist	Power Plant Technologist	Avionics Technologist	Structural Improvement Technologist	Process Improvement Technologist	Product Improvement Technologist
4	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
3	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
2	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level
1	No Level	No Level	No Level	No Level	No Level	No Level	No Level	No Level



**Table A 16: Job Titles: Engineering Services, Quality, Planning and Technical Publication & Records**

MSIC Section	M - PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES			
MSIC Division	71 - TECHNICAL TESTING AND ANALYSIS			
Sub Sector	CONTINUING AIRWORTHINESS MANAGEMENT ORGANISATION (CAMO)			
Job Area	Engineering Services (ES)	Quality	Planning	Technical Publication & Record
Sub Area Level				
8	Principal ES Specialist	Principal Quality Specialist	Principal Planning Specialist	Principal Technical Publication & Record Specialist
7	ES Specialist	Quality Specialist	Planning Specialist	Technical Publication & Record Specialist
6	Assistant ES Specialist	Assistant Quality Specialist	Assistant Planning Specialist	Assistant Technical Publication & Record Specialist
5	ES Technologist	Quality Technologist	Planning Technologist	Technical Publication & Record Technologist
4	Assistant ES Technologist	Assistant Quality Technologist	Assistant Planning Technologist	Assistant Technical Publication & Record Technologist
3	ES Assistant	Quality Assistant	Planning Assistant	Technical Publication & Record Assistant
2	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
1	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>



**Table A 17: Job Titles: Technical Support Services, Ground Handling, Supply Chain Management (SCM) and Quality Management**

MSIC Section	H - TRANSPORTATION & STORAGE			
MSIC Division	51 - AIR TRANSPORT			
Sub Sector	AEROSPACE SUPPORT SERVICES			
Job Area	TECHNICAL SUPPORT SERVICES	GROUND HANDLING	SUPPLY CHAIN MANAGEMENT (SCM)	QUALITY MANAGEMENT
Sub Area Level	<i>(No Sub Area)</i>	<i>(No Sub Area)</i>	<i>(No Sub Area)</i>	<i>(No Sub Area)</i>
8	Principal Technical Support Services Specialist	Principal Ground Handling Specialist	Principal SCM Specialist	Principal Quality Specialist
7	Technical Support Services Specialist	Ground Handling Specialist	SCM Specialist	Quality Specialist
6	Assistant Technical Support Services Specialist	Assistant Ground Handling Specialist	Assistant SCM Specialist	Assistant Quality Specialist
5	Technical Support Technologist*	Ground Handling Technologist	SCM Technologist	Quality Technologist
4	<i>No Level</i>	Assistant Ground Handling Technologist	<i>No Level</i>	<i>No Level</i>
3	<i>No Level</i>	Ground Handler	<i>No Level</i>	<i>No Level</i>
2	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>
1	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>	<i>No Level</i>



## SECTION 2: JOBS IN DEMAND

Please fill in the job(s) currently in demand in your organisation and factors contributing for the demand.  
(Refer to Table A7 to Table A17 of the Job Titles)

No.	Job Area (Divisions / Departments / Sections)	Job Titles (Positions)	Factor(s) contributing to the demand
1.			
2.			
3.			





### SECTION 3: SKILLS GAP(S)

Please provide the factors contributing to skills gaps and the description of the skills as required in your organisation.

No.	Skills In Demand	Factor(s) contributing to the demand	Description of the skills in demand
1.			
2.			
3.			
4.			



## SECTION 4: EMERGING SKILL(S)

Please fill in the emerging skills required for the job area relevant to your organisation. (Skills that are not yet core but required in the near future, if any)

No.	Emerging Skill(s)	Relevant Job Area(s)	Factor(s) contributing to the demand of the emerging skills	Description of the emerging skill(s)
1.				
2.				
3.				



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End of Questionnaire

Thank you for your cooperation.

From

National Aerospace Industry Coordinating Office (NAICO)  
Ministry of International Trade and Industry (MITI)

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## **ANNEX 4**

### **SAMPLE OF OCCUPATIONAL DESCRIPTIONS**



**SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance  
(Avionics - Rotary Wing)**

**Job Title: Avionics Manager (Level 7)**

An Avionics Manager (Rotary Wing) is responsible to oversee avionics department management and operations, manage avionics maintenance in terms of resources and safety procedures, maintain interface department flight and ground operations, review avionics maintenance quality and adherence to requirements, develop avionics innovative solutions and process, corrective action and subsequently recommend the avionics process to higher management. They are also responsible to plan and execute avionics team training, screen avionics employee recruitment and mentor avionics department at all levels.

**Responsibilities may include:**

- Oversee avionics department management and operations
- Mentor avionics department at all levels
- Ensure avionics department is safe and efficient
- Provide resources to support avionics maintenance
- Maintain avionics maintenance overall surveillance
- Plan and execute avionics team training
- Formulate avionics system corrective action
- Maintain interface department flight and ground operations
- Enforce avionics maintenance safety procedures
- Review avionics maintenance quality and adherence to requirements
- Maintain avionics system technical knowledge currency
- Ensure avionics staff work and competency is according to their level of competency
- Develop avionics innovative solutions and process
- Screen avionics employee recruitment
- Recommend avionics process to higher management
- Ensure tooling and equipment is calibrated and is in good condition

**Knowledge, Skills, Attitude**

An Avionics Manager (Rotary Wing) requires:

- Ability to manage the service, repair, and overall avionics maintenance of aircraft and verify aircraft is safe for flight and compliant with FAA regulations.
- Oversees the scheduling and timely completion avionics repairs and maintenance ensuring budget adherence.
- Ability to provide input to strategic decisions that affect the functional area of responsibility to senior level management.
- Capable of resolving escalated issues arising from maintenance and flight operations with coordination with other departments
- Possess extensive knowledge of the function and department processes.
- Independent, high leadership skill, and strategic management skills
- Integrity, discipline, dedication, responsible, teamwork, continuous learning and improvement.



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics - Rotary Wing)**

### **Job Title: Avionics Foreman (Level 6)**

An Avionics Foreman (Rotary Wing) is responsible to coordinate avionics department operations, supervise aircraft avionics maintenance and ensure maintenance compliance, authorise avionics engineer's general administrative process, perform avionics system maintenance and contribute changes in manuals. They are also responsible to monitor avionics tools and inventory condition and avionics department adequate working conditions.

#### **Responsibilities may include:**

- Supervise aircraft avionics maintenance
- Ensure avionics system maintenance compliance
- Schedule avionics system maintenance
- Supervise avionics engineering operations
- Authorise avionics engineers general administrative process
- Perform avionics department departmental working process
- Perform avionics system maintenance
- Nominate avionics engineers for training
- Contribute changes in manuals
- Coordinate avionics department operations
- Monitor avionics tools and inventory condition
- Monitor avionics department adequate working conditions

#### **Knowledge, Skills, Attitude**

An Avionics Foreman (Rotary Wing) requires:

- Possess basic management and administrative knowledge of an avionics department.
- Possesses supervisory role to trouble shoot operational problems in avionics operations.
- Possesses discipline with punctuality and professional manner and respect to avionics team.
- Ability to resolve disputes within avionics department operations and maintain a professional demeanour.
- Ability to understand basic avionics MRO business operation with good working knowledge on avionics systems.
- Ability to be a good communicator and people skills without domineering or over controlling.
- Ability to be a good motivator to the avionics team for better productivity.
- Ability to think quickly and act decisively in avionics maintenance operations.
- Ability to be a good assistant to manager in any situation and make educated and informed decisions that are beneficial.



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics - Rotary Wing)**

### **Job Title: B2 Licensed Aircraft Engineer (Type Rated-TR) (Level 5)**

A B2 Licensed Aircraft Engineer (Type Rated-TR) (Avionics - Rotary Wing) is responsible to inspect avionics component serviceability, test avionics systems per technical requirements, repair avionics systems per technical requirements, verify job cards accuracy and avionics system per technical requirements, troubleshoot and certify avionics system per technical requirements

#### **Responsibilities may include:**

- Inspect avionics component serviceability
- Test avionics systems per technical requirements
- Repair avionics systems per technical requirements
- Review manuals before performing task
- Verify job cards accuracy
- Troubleshoot avionics system per technical requirements
- Verify avionics system per technical requirements
- Certify avionics per technical requirements

#### **Knowledge, Skills, Attitude**

A B2 Licensed Aircraft Engineer (Type Rated-TR) (Avionics - Rotary Wing) requires:

- Possess detailed knowledge of the theoretical and practical aspects of the aircraft avionics and maintenance system.
- Possess safety awareness and airworthiness requirements of avionics systems.
- Possess proficiency in using avionics instruments and test equipment.
- Ability to provide a detailed description of the subject using theoretical fundamentals and specific examples.
- Ability to use mathematical formulae related to maintenance systems.
- Ability to read, understand and prepare sketches, simple drawings and schematics describing aircraft and maintenance systems.
- Ability to interpret results from various sources and measurements and apply corrective action where appropriate.
- Ability to apply basic physics principles in aircraft maintenance.
- Discipline, Dedication, Responsible, Continuous Learning and Continuous Improvement.
- Basic interpersonal skills.



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics - Fixed Wing)**

### **Job Title: Avionics Manager (Level 7)**

An Avionics Manager (Fixed Wing) is responsible to oversee avionics department management and operations, manage avionics maintenance in terms of resources and safety procedures, maintain interface department flight and ground operations, review avionics maintenance quality and adherence to requirements, develop avionics innovative solutions and process, corrective action and subsequently recommend the avionics process to higher management. They are also responsible to plan and execute avionics team training, screen avionics employee recruitment and mentor avionics department at all levels.

#### **Responsibilities may include:**

- Oversee avionics department management and operations
- Mentor avionics department at all level
- Ensure avionics department safe and efficient
- Provide resources to support avionics maintenance
- Maintain avionics maintenance overall surveillance
- Plan and execute avionics team training
- Formulate avionics system corrective action
- Maintain interface department flight and ground operations
- Enforce avionics maintenance safety procedures
- Review avionics maintenance quality and adherence to requirements
- Maintain avionics system technical knowledge currency
- Ensure avionics staff proper level
- Develop avionics innovative solutions and process
- Screen avionics employee recruitment
- Recommend avionics process to higher management
- Ensure tooling and equipment calibrated and good condition

#### **Knowledge, Skills, Attitude**

An Avionics Manager (Fixed Wing) requires:

- Ability to manage the service, repair, and overall avionics maintenance of aircraft and verify aircraft is safe for flight and compliant with FAA regulations.
- Oversees the scheduling and timely completion avionics repairs and maintenance ensuring budget adherence.
- Ability to provide input to strategic decisions that affect the functional area of responsibility to senior level management.
- Capable of resolving escalated issues arising from maintenance and flight operations with coordination with other departments
- Possess extensive knowledge of the function and department processes.
- Independent, High leadership skill and Strategic management skills
- Integrity, discipline, dedication, responsible, teamwork, continuous learning and improvement.





## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics - Fixed Wing)**

### **Job Title: Avionics Foreman (Level 6)**

An Avionics Foreman (Fixed Wing) is responsible to coordinate avionics department operations, supervise aircraft avionics maintenance and ensure maintenance compliance, authorise avionics engineers' general administrative process, perform avionics system maintenance and contribute changes in manuals. They are also responsible to monitor avionics tools and inventory condition and avionics department adequate working conditions.

#### **Responsibilities may include:**

- Supervise aircraft avionics maintenance
- Ensure avionics system maintenance compliance
- Schedule avionics system maintenance
- Supervise avionics engineers operationally
- Authorise avionics engineers general administrative process
- Execute avionics department smooth departmental working process
- Perform avionics system maintenance
- Nominate avionics engineers for training
- Contribute manuals changes
- Coordinate avionics department operations
- Monitor avionics tools and inventory condition
- Monitor avionics department adequate working conditions

#### **Knowledge, Skills, Attitude**

An Avionics Foreman (Fixed Wing) requires:

- Possess basic management and administrative knowledge of an avionics department.
- Possesses supervisory role to trouble shoot operational problems in avionics operations.
- Possesses discipline with punctuality and professional manner and respect to avionics team.
- Ability to resolve disputes within avionics department operations and maintain a professional demeanour.
- Ability to understand basic avionics MRO business operation with good working knowledge on avionics systems.
- Ability to be a good communicator and people skills without domineering or over controlling.
- Ability to be a good motivator to the avionics team for better productivity.
- Ability to think quickly and act decisively in avionics maintenance operations.
- Ability to be a good assistant to manager in any situation and make educated and informed decisions that are beneficial.



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance (Avionics - Fixed Wing)**

### **Job Title: B2 Licensed Aircraft Engineer (LAE) (Type Rated-TR (Level 5))**

A B2 Licensed Aircraft Engineer (LAE) (Type Rated-TR (Avionics - Fixed Wing) is responsible to inspect avionics component serviceability, test avionics systems per technical requirements, repair avionics systems per technical requirements, verify job cards accuracy and avionics system per technical requirements, troubleshoot and certify avionics system per technical requirements

#### **Responsibilities may include:**

- Inspect avionics component serviceability
- Testing avionics systems per technical requirements
- Repair avionics systems per technical requirements
- Review manuals before task
- Verify job cards accuracy
- Troubleshoot avionics system per technical requirements
- Verify avionics system per technical requirements
- Certify avionics per technical requirements

#### **Knowledge, Skills, Attitude**

A B2 Licensed Aircraft Engineer (LAE) (Type Rated-TR (Avionics - Fixed Wing) requires:

- Possess detailed knowledge of the theoretical and practical aspects of the aircraft avionics and maintenance system.
- Possess safety awareness and airworthiness requirements of avionics systems.
- Possess proficiency in using avionics instruments and test equipment.
- Ability to provide a detailed description of the subject using theoretical fundamentals and specific examples.
- Ability to use mathematical formulae related to maintenance systems.
- Ability to read, understand and prepare sketches, simple drawings and schematics describing aircraft and maintenance systems.
- Ability to interpret results from various sources and measurements and apply corrective action where appropriate.
- Ability to apply basic physics principles in aircraft maintenance.
- Discipline, Dedication, Responsible, Continuous Learning and Continuous Improvement.
- Basic interpersonal skills.



**SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Aircraft Painting)**

**Job Title: Painting Technician (Level 2)**

A Painting Technician is responsible to obtain job sheet, identify job sheet requirement, aircraft components requirement, apply masking tape to required area, apply primers or top coat to required area as per work instructions, operate equipment such as paint gun, air compressor, orbital sander and paint shaker.

**Responsibilities may include:**

- Obtain Job sheet
- Identify Job sheet requirement
- Identify aircraft components requirement
- Apply masking tape to required area
- Apply primers to required area
- Apply top coat to required area
- Operate paint gun
- Operate air compressor
- Operate orbital sander
- Operate paint shaker

**Knowledge, Skills, Attitude**

A Painting Technician requires:

- Knowledge on painting technique
- Adhere to PPE requirements.
- Adhere to safety requirements.
- Meticulous



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Air Traffic System**

### **Job Title: Assistant Communication Maintenance Engineer (Level 4)**

An Assistant Communication Maintenance Engineer is responsible to perform electronic radio communication corrective maintenance, electronic radio communication manual trouble shoot/fault findings, electronic radio communication LRU replacing, communication switching matrix corrective maintenance, communication switching matrix manual trouble shoot/fault findings and communication switching matrix LRU replacing.

#### **Responsibilities may include:**

- Perform electronic radio communication corrective maintenance.
- Perform electronic radio communication manual trouble shoot/fault findings.
- Perform electronic radio communication LRU replacing.
- Perform communication switching matrix corrective maintenance.
- Perform communication switching matrix manual trouble shoot/fault findings.
- Perform communication switching matrix LRU replacing.

#### **Knowledge, Skills, Attitude**

An Assistant Communication Maintenance Engineer requires:

- Knowledge on ICAO and DCA standards
- Knowledge on Air Traffic Services and operational environment
- Knowledge on Air Space Standards, Aeronautical Information Systems
- Knowledge on Meteorology and altimetry
- Knowledge on Communication, Navigation, Surveillance & Air Traffic Management (CNS/ATM) concepts
- Knowledge of human factors in ATSEP work to decrease the accident rate
- Adhere to PPE requirements



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Air Traffic System**

### **Job Title: Assistant Navigation Maintenance Engineer (Level 4)**

An Assistant Navigation Maintenance Engineer is responsible to perform electronic navigation DVOR corrective maintenance, electronic navigation DVOR manual trouble shoot/fault findings, electronic navigation DVOR LRU replacing, electronic navigation ILS corrective maintenance, electronic navigation ILS manual trouble shoot/fault findings, electronic navigation ILS LRU replacing, electronic navigation DME corrective maintenance, electronic navigation DME manual trouble shoot/fault findings, electronic navigation DME LRU replacing, electronic navigation GP corrective maintenance, electronic navigation GP manual trouble shoot/fault findings and electronic navigation GP LRU replacing.

#### **Responsibilities may include:**

- Perform electronic navigation DVOR corrective maintenance.
- Perform electronic navigation DVOR manual trouble shoot/fault findings.
- Perform electronic navigation DVOR LRU replacing.
- Perform electronic navigation ILS corrective maintenance.
- Perform electronic navigation ILS manual trouble shoot/fault findings.
- Perform electronic navigation ILS LRU replacing.
- Perform electronic navigation DME corrective maintenance.
- Perform electronic navigation DME manual trouble shoot/fault findings.
- Perform electronic navigation DME LRU replacing.
- Perform electronic navigation GP corrective maintenance.
- Perform electronic navigation GP manual trouble shoot/fault findings.
- Perform electronic navigation GP LRU replacing.

#### **Knowledge, Skills, Attitude**

An Assistant Navigation Maintenance Engineer requires:

- Knowledge on ICAO and DCA standards
- Knowledge on Air Traffic Services and operational environment
- Knowledge on Air Space Standards, Aeronautical Information Systems
- Knowledge on Meteorology and altimetry
- Knowledge on Communication, Navigation, Surveillance & Air Traffic Management (CNS/ATM) concepts
- Knowledge of human factors in ATSEP work to decrease the accident rate
- Adhere to PPE requirements



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Air Traffic System**

### **Job Title: Assistant Surveillance Maintenance Engineer (Level 4)**

An Assistant Surveillance Maintenance Engineer is responsible to perform surveillance systems PSR corrective maintenance, surveillance systems PSR manual trouble shoot/fault findings, surveillance systems PSR LRU replacing, surveillance systems SSR corrective maintenance, surveillance systems SSR manual trouble shoot/fault findings and surveillance systems SSR LRU replacing.

#### **Responsibilities may include:**

- Perform surveillance systems PSR corrective maintenance.
- Perform surveillance systems PSR manual trouble shoot/fault findings.
- Perform surveillance systems PSR LRU replacing.
- Perform surveillance systems SSR corrective maintenance.
- Perform surveillance systems SSR manual trouble shoot/fault findings.
- Perform surveillance systems SSR LRU replacing.

#### **Knowledge, Skills, Attitude**

An Assistant Surveillance Maintenance Engineer requires:

- Knowledge on ICAO and DCA standards
- Knowledge on Air Traffic Services and operational environment
- Knowledge on Air Space Standards, Aeronautical Information Systems
- Knowledge on Meteorology and altimetry
- Knowledge on Communication, Navigation, Surveillance & Air Traffic Management (CNS/ATM) concepts
- Knowledge of human factors in ATSEP work to decrease the accident rate
- Adhere to PPE requirements



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Air Traffic System**

### **Job Title: Assistant Air Traffic Management Maintenance Engineer (Level 4)**

An Assistant Air Traffic Management Maintenance Engineer is responsible to perform air traffic management corrective maintenance, air traffic management manual trouble shoot/fault findings and air traffic management LRU replacing.

#### **Responsibilities may include:**

- Perform air traffic management corrective maintenance.
- Perform air traffic management manual trouble shoot/fault findings.
- Perform air traffic management LRU replacing.

#### **Knowledge, Skills, Attitude**

An Assistant Air Traffic Management Maintenance Engineer requires:

- Knowledge on ICAO and DCA standards
- Knowledge on Air Traffic Services and operational environment
- Knowledge on Air Space Standards, Aeronautical Information Systems
- Knowledge on Meteorology and altimetry
- Knowledge on Communication, Navigation, Surveillance & Air Traffic Management (CNS/ATM) concepts
- Knowledge of human factors in ATSEP work to decrease the accident rate
- Adhere to PPE requirements



## **SUB-SECTOR: Aircraft Manufacturing: Aircraft Production (Machining)**

### **Job Title: Machinist (Level 2)**

A Machinist is responsible to identify basic hand, measurement and cutting tools information, identify data cards and technical instruction and chemical requirement, apply fixtures and inserts to machine, confirm NC programs requirement, operate CNC machine, carry out cleaning process and implement inspection process.

#### **Responsibilities may include:**

- Determine workflow process.
- Interpret blue print/engineering drawing requirement.
- Interpret GD&T requirement.
- Identify basic hand, measurement and cutting tools information.
- Identify data cards and Technical Instruction requirement.
- Identify chemical requirement.
- Apply fixtures and inserts to machine.
- Confirm NC programs requirement.
- Load product onto CNC machine.
- Use control panels on CNC machine.
- Operate CNC machine.
- Setup cleaning equipment.
- Carry out cleaning process.
- Implement inspection process.

#### **Knowledge, Skills, Attitude**

A Machinist requires:

- Ability to read and communicate in English and understand safety rules, operating & maintenance instructions, and procedure manuals.
- Ability to interpret blueprint/engineering drawings and GD&T.
- Ability to apply CNC programs.
- Demonstrate the desire for continuous learning.
- Independent with minimum supervision.
- Ability to deal with stressful situations.
- Team player.





**SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Composite)**

**Job Title: Composite Engineer (Level 5)**

A Composite Engineer is responsible to analyse production planning requirement and mould requirement, carry out production planning, control production planning implementation, prepare production planning report, coordinate mould development, mould design evaluation and prepare mould report. They are also responsible to analyse production quality status, manage quality documentation control and prepare quality assurance report, plan budget and cost estimation and monitor production cost and manage manpower requirements, costing and plan manpower career path.

**Responsibilities may include:**

- Analyse production planning requirement.
- Ensure stock availability.
- Carry out production planning.
- Control production planning implementation.
- Prepare production planning report.
- Analyse mould requirement.
- Coordinate mould development.
- Carry out mould design evaluation.
- Prepare mould report.
- Analyse production quality status.
- Ensure production quality assurance.
- Manage quality documentation control.
- Prepare quality Assurance report.
- Analyse budget and cost requirement.
- Prepare budget and cost estimation.
- Monitor production cost.
- Prepare budget & cost report.
- Monitor production cost.
- Manage manpower requirement.
- Prepare manpower cost.
- Control manpower attrition.
- Perform manpower appraisal.
- Plan manpower career path.

**Knowledge, Skills, Attitude**

A Composite Engineer requires:

- Adhere to work procedure and 5S requirements.
- Adhere to procedures to handling materials.
- Precise measuring, labelling and cutting materials.
- Sincere reporting of defect findings.
- Organise work systematically and result oriented.



## **SUB-SECTOR: Maintenance Repair Overhaul (MRO): Aircraft Maintenance Structure Engineering (Composite)**

### **Job Title: Composite Technician (Level 3)**

A Composite Technician is responsible to check raw material requirement, prepare raw material and composite material, check composite material requirement, carry out material cutting and material kitting, organise work area, check mould requirement, carry out mould checking, composites panel finishing and composites panel packaging. They are also responsible to maintain mould condition and perform laminating process, curing process and trimming process as per work instructions.

#### **Responsibilities may include:**

- Check raw material requirement.
- Prepare raw material.
- Check composite material requirement.
- Prepare composite material.
- Carry out material cutting.
- Carry out material kitting.
- Organise work area.
- Check mould requirement.
- Carry out mould checking.
- Maintain mould condition.
- Perform laminating process.
- Perform curing process.
- Perform trimming process.
- Check composites panel finishing.
- Check composites panel packaging.
- Perform composites panel packaging.

#### **Knowledge, Skills, Attitude**

A Composite Technician requires:

- Adhere to work procedure.
- Adhere to procedures to handling materials.
- Precise measuring, labelling and cutting materials.
- Sincere reporting of defect findings.
- Detailed complete documents.
- Organise work systematically.
- Adhere to 5S requirements.
- Analysing process efficiency.
- Effective in delivering ideas.
- Honest checking end product.
- Result oriented.



**SUB-SECTOR: Aircraft Manufacturing Quality Assurance (QA)/Aerospace Support Services Quality Management**

**Job Title: Quality Assurance Assistant Engineer, Quality Inspection Assistant Engineer (Level 5)**

A Quality Assurance Assistant Engineer is responsible to review quality manual compliance, quality procedures record, work instructions, documentation, approvals, maintain document validity, liaise with regulatory body approvals, and coordinate regulatory body approvals and customer compliance.

**Responsibilities may include:**

- Review quality manual compliance.
- Review quality procedures record.
- Review work instructions.
- Review documentation.
- Review approvals.
- Liaise with regulatory body approvals.
- Adhere to quality procedures compliance.
- Coordinate regulatory body approvals.
- Coordinate customer compliance.

**Knowledge, Skills, Attitude**

A Quality Assurance Assistant Engineer requires:

- Independent attitude.
- Problem-solving technique.
- Attention to details.
- Team oriented.
- Interpersonal Communication skill.
- Ability to plan and organise.
- Understanding of Quality Systems and ISO.
- Industrial/Operations knowledge.
- Knowledge of BCAR/MCAR/FAA and other NAA regulations.



## **SUB-SECTOR: Aircraft Manufacturing Quality Assurance (QA)/Aerospace Support Services Quality Management**

### **Job Title: Quality Assurance Engineer (Level 6)**

A Quality Assurance Engineer is responsible to develop quality procedures standard, work instruction standard and documentation standards, manage approvals for compliance, investigate incidents for compliance (corrective actions), audit quality manual compliance, quality procedures compliance, work instructions compliance, documentation compliance and approvals compliance. They are also responsible to train management/employee for requirements, standard and compliance and improve quality procedures standard, work instructions compliance and work instructions for plan (audit).

#### **Responsibilities may include:**

- Assess quality manual standards, quality procedures and work instruction.
- Determine quality procedures requirement, quality procedures standard and quality procedures compliance.
- Advice management on compliance.
- Develop quality procedures standard, work instruction standard and documentation standard.
- Manage approvals for compliance.
- Investigate incidents for compliance (corrective actions).
- Audit quality manual compliance, quality procedures compliance, work instructions compliance, documentation compliance and approvals compliance.
- Assess quality manual requirement, quality procedures standard, work instructions compliance and documentation compliance.
- Train management/employee for requirements, standard and compliance.
- Improve quality procedures standard, work instructions compliance and work instructions for plan (audit).

#### **Knowledge, Skills, Attitude**

A Quality Assurance Engineer requires:

- Independent attitude.
- Problem-solving technique.
- Meticulous.
- Industrial/Operations knowledge.
- People management approach.
- Interpersonal skill.
- Business writing/report writing.
- Analytical.
- Facilitation skills.
- Understanding of Quality Systems and ISO.
- Knowledge of BCAR/MCAR/FAA and other NAA regulations.



## **SUB-SECTOR: Engineering & Design: Engineering Design**

### **Job Title: Design Engineer (Level 5)**

A Design Engineer is responsible to access Product Data Management (PDM) for documentation, Identify documentation for requirements, documentation for standards and documentation for specifications, determine Computer/Work Station requirements and CAD Software requirements, produce 3D CAD Model for DMU (Digital Mock-Up), 2D Drawing for certification , produce BOM for DFM (Design for manufacturing), convert 3D CAD Model to 2D Drawing, convert 2D Drawing to 3D CAD Model and check 3D CAD Model errors, 2D Drawing Model errors and BOM errors.

#### **Responsibilities may include:**

- Access Product Data Management (PDM) for documentation.
- Identify documentation for requirements, documentation for standards and documentation for specifications.
- Determine Computer/Work Station requirements and CAD Software requirements.
- Produce 3D CAD Model for DMU (Digital Mock-Up), 2D drawing for certification.
- Produce BOM for DFM (Design for manufacturing).
- Convert 3D CAD Model to 2D Drawing.
- Convert 2D Drawing to 3D CAD Model.
- Check 3D CAD Model errors, 2D Drawing Model errors and BOM errors.

#### **Knowledge, Skills, Attitude**

A Design Engineer requires:

- Computer literacy in Windows environment.
- Knowledge and skills in PDM system.
- Ability to identify detailed documentation.
- CAD software skills.
- Ability to generate aerospace standard engineering drawings including BOM and 3D modelling.
- Good communication and reporting skills.
- Ability to visualise and conceptualise component 3D models from engineering drawings.
- Familiarity with Documentation, Standards and Specifications.
- Ability to produce engineering drawings and 3D modelling adhering to the standards and best practises of Aerospace Industry.
- Knowledge of aerospace product and design lifecycle (i.e. conceptual design, preliminary, detailed design, design for manufacturing).
- Attention to details.
- Pro-active in getting up to date with the latest CAD Software, technology and Design Standards.

