,

OCCUPATIONAL ANALYSIS

AVIATION INDUSTRY

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ABSTRACT

An Occupational Analysis (OA) is the process of identifying the work scope of the occupational sub-area in terms of competencies. It is used to analyze 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 being an industrial overview highlighting the definition and scope of the industry, the current analysis of the local industry and its skilled worker requirements, Government bodies and development plans supporting the growth of the industry, then the next chapter will explain the methodology used in OA development such as qualitative analysis through brainstorming discussion sessions. Workshops will be held to get a better understanding of the organisational structure, job titles, hierarchy objectives and main activities of the specified positions. The final chapters will present the findings of the Occupational Analysis that is translated into the Occupational Structures, levels of competencies and critical sub-areas. These findings will in turn be the basis of reference for the development of the NOSS document. In order to conduct the OA on the Aviation industry, all the information related to the aforesaid industry is gathered through literature review and further discussed in workshop sessions with experts from the industry. A total of 5 sub-sectors (Air Cargo Handling, Ground Handling, Airport Operation and Management, Maintenance , Repair and Overhaul and Airlines Operation) and 342 job titles were identified under the Aviation Industry.

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DCAM	Department of Civil Aviation, Malaysia
DESCUM	Development of Standard and Curriculum
DSD	Department of Skills Development
ETP	Economic Transformation Programme
EPP	Entry Point Project
OA	Occupational Analysis
OAA	Occupational Area Analysis
OS	Occupational Structure
OAS	Occupational Area Structure
MSIC	Malaysian Standards of Industry Classification
MOSQF	Malaysian Occupational Skills Qualification Framework
MQA	Malaysia Qualification Agency
MSC	Malaysian Skills Certificate
NOSS	National Occupational Skills Standard

1. INTRODUCTION

1.1 CHAPTER INTRODUCTION

This chapter will explain the objectives, scope and problem statement of the Occupational Analysis for the Aviation Industry.

An Occupational Analysis (OA) is the process of identifying the sub-sectors, areas, sub-areas and job titles for a particular industry in the form of Occupational Structure (OS). The Occupational Analysis (OA) will also look at other elements such as common job titles and levels of competency for skilled personnel in the industry, job functions and industry overview. Every job title will be identified according to its level defined in the Malaysian Occupational Skills Qualification Framework (MOSQF) level descriptor (refer to Annex 1). It must be highlighted that the occupational structure should not reflect the organisational chart but rather the competency levels and possible career path for personnel under a particular sub-sector in the industry.

The OA requires input from all parties especially industry players, statutory bodies, training institutions among others. The identified job titles obtained during the OA will be used as reference during National Occupational Skills Standard (NOSS) development. By developing the NOSS, personnel in the industry can be deemed certified by undergoing three methods of skills training certification.

The first of the three methods are certification through full time training where the candidate will undergo training from a minimum of 3 months for entry level certificates (Malaysia Skills Certificate 1,2 and 3) or up until over a year for Malaysian Skills Diploma or Advanced Diploma. The second method is via the apprenticeship scheme which is called the National Dual

Training System (NDTS) where the candidate can undergo training for a certain block of time then be attached to a company in the related industry as approved by the Department of Skills Development, Ministry of Human Resources. The third method is via Accreditation of Prior Experience where the candidate that possesses working experience may be able to be certified based on duration of experience and proof of work.

Therefore, it can be said that with the development of the OA and subsequently the relevant NOSS will provide wider opportunities for personnel to be trained and certified.

1.2 BACKGROUND OF THE AVIATION INDUSTRY

The Aviation Industry includes those activities that are directly dependent on transporting people and goods by air. Airports and airlines services are the terms that describe the industry comprehensively. The Aviation industry can be generally defined into 5 main sub-sectors which are:

- Air Cargo Handling
- Ground Handling
- Airports Operation and Management
- Maintenance, Repair and Overhaul (MRO)
- Airline Operation

These subsectors share a common mission of activities which is travelling people or goods and services to their expected destination or determined place.

1.3 OBJECTIVES OF AVIATION INDUSTRY OCCUPATIONAL ANALYSIS

The objectives of this Occupational Analysis are as below:

i) To identify the Occupational Structure and Occupational Area Structure of the Aviation Industry

ii) To conduct a supply and demand analysis of the Aviation Industry workforce

1.4 SCOPE OF OCCUPATIONAL ANALYSIS

The scope of this particular OA is focused on the Civil Aviation industry and all sub-sectors that are defined to be under the Civil Aviation industry.

The scope of this occupational analysis is relevant to the objectives above are as follows:

i) Objective 1 : To identify the Occupational Structure and Occupational Area Structure of the Aviation Industry

The scope of this particular OA is focused on the Aviation Industry and all sub-sectors that are defined to be under the Aviation Industry. These sub-sectors are defined as in Malaysia in order to ensure the OA will be in line with local industry segmentation.

ii) Objective 2 : To conduct a supply and demand analysis of the Aviation Industry workforce

The demand side data referred in the supply and demand analysis was secondary data obtained from the Department of Statistics, Malaysia where the 3 digit group for the statistics was cross referenced with the 3 digit groups of industrial classification obtained from the Malaysian Standard Industrial Classification (MSIC) which were relevant to the industry.

Whereas, supply side data includes data from the Department of Skills Development, Approved Training Organisations and Public Higher Learning Institutions. Data from the Private Higher Learning Institutions had to be omitted due to inconsistency as data was not available for all the 3 years analysed in this research.

It must be highlighted that the outcome of this OA will be to identify and acknowledge the various job titles available directly under the Aviation Industry. In the event that skills training is required for particular job titles then the development of the National Occupational Skills Standards (NOSS) will be considered. However, the development of the NOSS must be analysed as whether it would be suitable for certain job titles that might require a high level of underlying theoretical knowledge or require professional and international certification. The development of the NOSS for these job titles would be analysed on a case by case basis.

1.5 PROBLEM STATEMENT

There have been at least 25 National Occupational Skills Standard (NOSS) documents developed for the Aviation industry as listed in the NOSS registry, year 2013. (Details of the existing NOSS relevant to the Aviation industry are included in Chapter 2). However, a complete analysis on the Occupational Structure of the Aviation industry has not been undertaken before this. Therefore, in order to identify the overall structure and available career paths in the industry, the Occupational Analysis must be done on this industry.

1.6 CHAPTER CONCLUSION

In light of encouraging economic activity in the Aviation industry, the demand for sufficient skilled personnel has increased and the development of skilled manpower is timely. With the Occupational Structure clearly defined, the industry stakeholders will be able to identify sub-areas that will require more intensive efforts in human capital development. Although there have been past efforts in National Standards Development for the industry, the need for an Occupational Analysis is required to determine the overall sub-areas that may not yet have been focused on. The Occupational Structure that will be the outcome of this analysis can be utilised as a 'blueprint' for manpower planning in the Aviation industry.

2. OVERVIEW OF THE AVIATION INDUSTRY IN MALAYSIA

2.1 CHAPTER INTRODUCTION

This chapter will focus on the explanation of the Aviation industry, the current scenario in Malaysia, introduction to relevant acts, government bodies and benchmark countries pertaining to the Aviation industry.

Findings in this chapter have been obtained via literature/document review and then detailed through observation, interviews with industry practitioners and discussions during workshops with development panel members. This literature/document review has been further discussed with panel members to obtain insight on the matters at hand from a practitioner's perspective.

2.2 DEFINITION OF THE AVIATION INDUSTRY

Aviation comes from the Latin *avis* meaning "bird," an appropriate translation given that aviation deals with travel by air, specifically in a plane. The aviation industry is the business sector dedicated to manufacturing and operating all types of aircraft.[1]

The aviation industry is the business sector dedicated to manufacturing and operating all types of aircraft. The Aviation industry involves the managing of airlines, air couriers, airports, helicopter and general aviation, and other ancillary services such as maintenance, repair and overhaul of aircrafts, managing the navigational aid system, air traffic control and in-flight food caterings, hotels and retail stores.[2]

[1] Vocabulary.com. http://www.vocabulary.com/dictionary/aviation
[2] CIVIL AVIATION INDUSTRY http://aviationtraining.com.my/about/chief-executive.html

2.3 CURRENT NATIONAL OCCUPATIONAL SKILLS STANDARD (NOSS) FOR THE AVIATION INDUSTRY

In order to analyse the industry, the existing National Occupational Skills Standard (NOSS) documents will be referred. In the DSD's NOSS Registry, the existing NOSS can be seen in the following figures included in this section.

Table 2.1: NOSS Relevant to the Aviation Industry

	Pesawat (Mekanikal) *(Aircraft (Mechanical))*	**Pesawat (Avionik)** *(Aircraft (Avionics))*	
L5	**TP-060-5:2013** Operasi Penyelenggaran Pesawat dan Persijilan *Aircraft Maintenance Operation and Certification* (25-10-10),(30-12-2013)	**TP-071-5** Jurutera Penyelenggaran Pesawat Avionik (Elektrik) *Aircraft Maintenance Engineer Avionics (Electrical)* (25-10-10)	**TP-072-5** Jurutera Penyelenggaran Pesawat Avionik (Instrumen) *Aircraft Maintenance Engineer Avionics (Instrument)* (25-10-10)
L4	**TP-060-4:2013** Operasi Penyelenggaran Pesawat dan Persijilan *Aircraft Maintenance Operation and Certification (Limited Maintenance Authorization)* (25-10-10),(30-12-2013)	**TP-070-4** Juruteknik Penyelenggaran Pesawat (Avionik) *Aircraft Maintenance Technician (Avionics)* (25-10-10)	
L3	**TP-060-3:2013** Operasi Penyelenggaran Pesawat(Tidak Dipersijilkan) *Aircraft Maintenance Operation (Non Certifying)* (30-12-2013)		
L2 **L1**	Tiada Tahap *(No Level)*		

	Pesawat- Kerangka *(Aircraft – Body Frame)*	**Turbin Helikopter** *(Helicopter Turbine)*
L5 **L4**	Belum ada *(Not Available)*	
L3	**Q-060-3** Mekanik Pesawat : Pembaikan Struktur Logam *Aircraft Mechanic: Metal Structural Repair* (24-09-98)	**Q-070-3** Mekanik Pesawat (Mekanikal)- Helikopter Turbin *Aircraft Mechanic (Mechanical) – Helicopter Turbine* (07-10-99)
L2 **L1**	Tiada Tahap *(No Level)*	

(Source: DSD NOSS Registry April 2014)

Table 2.1: NOSS Relevant to the Aviation Industry (continued)

	Perkhidmatan Dalam Penerbangan *(In-Flight Services)*
L5	Belum ada *(Not Available)*
L4	
L3	**TP-077-3:2013** Perkhidmatan Dalam Penerbangan *In-Flight Services* (30-12-2013)
L2	Tiada Tahap *(No Level)*
L1	

	Operasi & Penyelenggaraan Lapangan Terbang *(Airport Operation & Maintenance)*		
	(Aeronautical Ground Lighting)	***(Baggage Handling System)***	***(Passenger Boarding Bridge)***
L5	Belum ada *(Not Available)*		
L4			
L3	**TP-801-3:2013** *Aeronautical Ground Lighting Maintenance* (30-12-2013)	**TP-802-3:2013** *Baggage Handling System Operation & Maintenance Services* (30-12-2013)	**TP-803-3:2013** *Passenger Boarding Bridge Operation & Maintenance Services* (30-12-2013)
L2	Tiada Tahap *(No Level)*		
L1			

	Penyelenggaraan Pesawat *(Air Craft Maintenance)*	**Peralatan Sokongan Darat Pesawat** *(Aircraft Ground Support Equipment)*
L5	Belum ada *(Not Available)*	
L4		
L3	**TP-040-3** Juruteknik Kanan Penyenggaran Dalaman Pesawat *Senior Air Craft Interior Maintenance Technician* (23-06-2009)	**TP-051-3** Juruteknik Peralatan Sokongan Darat Pesawat *Aircraft Ground Support Equipment Technician* (7-10-99) (25-10-10)
L2	**TP-040-2** Juruteknik Penyenggaran Dalaman Pesawat *Air Craft Interior Maintenance Technician* (23-06-2009)	Tiada Tahap *(No Level)*
L1	**TP-040-1** Juruteknik Rendah Penyenggaran Dalaman Pesawat *Junior Air Craft Interior Maintenance Technician* (23-06-2009)	

(Source: DSD NOSS Registry April 2014)

Table 2.1: NOSS Relevant to the Aviation Industry (continued)

<table>
<tr><th></th><th>Servis Tanjakan
(Ramp Services)</th><th>Servis Hangar
(Hangar services)</th><th>Pengendalian Bumi
(Ground Handling)</th><th>Pengurusan Pelepasan
(Departure Handling)</th></tr>
<tr><td>L5</td><td colspan="4" rowspan="2">Belum ada
(Not Available)</td></tr>
<tr><td>L4</td></tr>
<tr><td>L3</td><td>TP-800-3:2011
Ground Handling- Ramp Services
(18-11-11)</td><td rowspan="3">Belum ada
(Not Available)</td><td>TP-078-3:2013
Operasi Pengendalian Bumi
Ground Handling Operation
(30-12-2013)</td><td rowspan="3">Belum ada
(Not Available)</td></tr>
<tr><td>L2</td><td>TP-800-2:2011
Ground Handling- Ramp Services
(18-11-11)</td><td rowspan="2">Tiada Tahap
(No Level)</td></tr>
<tr><td>L1</td><td>TP-800-1:2011
Ground Handling- Ramp Services
(18-11-11)</td></tr>
</table>

(Source: DSD NOSS Registry April 2014)

It can be summarised that there are 19 NOSS documents developed relevant to the Aviation Industry covers the sub-sectors of MRO, Ground Handling, Airline Operations and Airport Operations and Management.

2.4 CURRENT ANALYSIS OF THE AVIATION INDUSTRY IN MALAYSIA

Strategically situated in the world's region of growth, Malaysia's aviation landscape continues with significant growth and rapid development. In the early stages, aviation in Malaysia focused on domestic services including bridging the divide between East and West Malaysia. Today civil aviation is an integral part of Malaysia's globalised economy. Aviation contributes much to the national economy connecting the nation to global markets. It has facilitated trade, expanded export markets, generated tourism and is a key enabler of business and commerce. Civil aviation in Malaysia has progressed along with global advances in aviation. Malaysia has emerged as a vital hub in the Asia Pacific Region due to a clear aviation policy and the advantage of strong economic fundamentals. Working with all aviation stakeholders, Malaysian aviation authorities are committed to safety,

security and environmental protection as well as the sustainable development of air transport.

Open-skies agreements, greater competition, business-friendly measures, enhanced connectivity, increased air transport availability and efficiency as well as continuous transformation are characteristics of Malaysia's progressive liberal aviation regime. Existing policies will be continuously fine-tuned and new strategies formulated as part of efforts to promote further liberalization and sustainable air transport. Malaysia's signing and ratification of ASEAN open-skies agreements enable designated carriers to operate third, fourth and fifth freedom traffic rights between any cities of ASEAN with unlimited frequencies and aircraft type. Malaysia's national carrier, Malaysia Airlines, currently flies to 46 destinations across six continents.

Much of the recent growth of the airline industry has been attributed to the emergence of low-cost carriers. In an increasingly competitive environment, low-cost carriers have created new demand, opened new hubs and accessed secondary markets and their operations have made the world a smaller place. They now have access to lucrative routes and have plans to tap the rich Asia Pacific travel market. Low-cost carrier operations have made air travel more affordable and accessible with competitive fares.

Malaysia has an active investment policy for airports with a well-developed and extensive airport network. Airport development in Malaysia is generally based on traffic forecasts. Malaysia's six international airports and 16 domestic airports contribute much to economic development as well as rapid and significant growth in passenger volume and cargo handled at airports. Malaysia's main gateway, the Kuala Lumpur International Airport or KLIA, is testimony to the active investment policy and supply driven airport infrastructure capacity. The airport has sufficient

capacity planned to handle up to 100 million passengers per annum. It is an eco-friendly airport and handles A380 operations.

In recognizing the potential of the business model pioneered by low-cost aviation, Malaysia built Asia Pacific's first low-cost terminal at KLIA in March 2006 to cater to low-cost operations in the region. Supporting Infrastructure and facilities have also been provided at other international airports. KLIA2 is testimony to Malaysia's strategic development objectives, supply driven airport infrastructure and renewed focus on growth areas. KLIA2 is a new terminal at the Kuala Lumpur International Airport designed to meet the continued demands of low-cost carriers. It is the world's largest purpose built terminal for low-cost carriers. It is the world's largest purpose built terminal for low-cost carriers.[4]

2.5 AVIATION INDUSTRY STATUTORY, REGULATORY BODIES, GOVERNMENT AGENCIES AND ORGANISATIONS

(i) ICAO (International Civil Aviation Organization)

The International Civil Aviation Organization (ICAO) is a specialised agency of the United Nations which codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. ICAO was created in 1944 (as a result of the agreements of the Chicago Convention- The convention of Chicago is a Convention on International Civil Aviation, signed in Chicago on 07/12/1944) to promote the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency and regularity, as well as for aviation environmental protection. The Organization serves as

[4]KLIA2.ICAO Journal. March, 2012

the forum for cooperation in all fields of civil aviation among over 190 Member States. The main elements of ICAO are: the Assembly, the Council, the air Navigation Commission. Its headquarters are located in the Quartier International of Montreal, Quebec, Canada. ICAO divides the world into Regions; each region having its own Regional Office (Africa-Indian Ocean, Caribbean, Europe, Middle East/Asia, North Atlantic, Pacific, and South America) there are 18 Annexes to the Chicago Convention which contain ICAO Standards and Recommended Practices (SAPRS). Each Annex concerns a specific subjoin area of importance to civil aviation.

(ii) European Aviation Safety Agency (EASA)

The European Aviation Safety Agency (EASA) is an agency of the European Union (EU) with offices in Cologne, Germany, which has been given regulatory and executive tasks in the field of civilian aviation safety. It was created on 15 July 2002, and it reached full functionality in 2008, taking over functions of the JAA (Joint Aviation Authorities). European Free Trade Association (EFTA) countries have been granted participation in the agency. The agency's responsibilities include: expert advice to the EU for drafting new legislation; implementing and monitoring safety rules, including inspections in the Member States; type-certification of aircraft and components, as well as the approval of organizations involved in the design, manufacture and maintenance of aeronautical products; authorization of third-country (non EU) operators; safety analysis and research

(iii) IATA (International Air Transport Association)

Air transport is one of the most dynamic industries in the world. The International Air Transport Association (IATA) is its global trade organisation founded in Havana, Cuba in April 1945. IATA is an

independent body sponsored by and designed to serve and represent the airline travel industry. It has become an important body for raising standards in the industry through agreements, training and information. Over more than 65 years, IATA has developed the commercial standards that built a global industry. Today, the IATA mission is to represent, lead and serve the airline industry. Its members comprise over 230 airlines including the world's leading passenger and cargo airlines and representing about 93% of scheduled international air traffic. Therefore, IATA is the prime vehicle for inter-airline cooperation in promoting safe, reliable, secure and economical air services for the benefit of the world's consumers. IATA seeks to improve understanding of the industry among decision makers and increase awareness of` the benefits that aviation brings to national and global economies. It fights for the interests of airlines across the globe, challenging unreasonable rules and charges, holding regulators and governments to account and striving sensible regulation. IATAs aim is to help airlines help themselves by simplifying processes and increasing passenger convenience while reducing costs and improving efficiency. Moreover, safety is IATAs number one priority, and IATAs goal is to continually improve safety standards, notably through IATAs Operational Safety Audit (IOSA). Another main concern is to minimize the impact of air transport on environment. IATA ensures that people and goods can move around the global airline network as easily as if they were on a single airline in a single country. In addition, it provides essential professional support to all industry stakeholders with a wide range of products and expert services, such as publications, training and consulting. IATAs financial systems also help carriers and the travel industry maximize revenues.

(iv) Department of Civil Aviation Malaysia

The DCAM is established as an agency 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 DCAM in ensuring compliance to standards and recommended practices of the International Civil Aviation Organization (ICAO).[6]

(v) Ministry of Transport

The Aviation Division is one of the divisions in Ministry of Transport Malaysia. This division is responsible for all civil aviation affairs in Malaysia[7]. The objectives of the division are to develop an efficient, economical and safe air transport system for passengers and cargo and to plan and implement infrastructural projects to meet the demands of air transport. This division is made up of five units as follow:

- Air Transport
- Airport Services
- Aerospace & Industrial Hub
- Licensing & Rural Air Services
- Safety/Security & Convention

There are several functions of the aviation division which are to plan and review the policies relating to air services from time to time, to expand the international air services network through air negotiations, to ensure the planning, building and maintenance of airport infrastructure is in accordance with the specified standards, to ensure

[6]Department of Civil Aviation.Profile. http://www.dca.gov.my
[7]Aviation Division.Background. http://www.dca.gov.my

that all existing rules and regulations in air transport / aviation are in accordance with the guidelines stipulated by the International Civil Aviation Organisation (ICAO). The International Civil Aviation Organization (ICAO) is a UN specialized agency, created in 1944 upon the signing of the Convention on International Civil Aviation (Chicago Convention). ICAO works with the Convention's 191 Signatory States and global industry and aviation organizations to develop international Standards and Recommended Practices (SARPs) which are then used by States when they develop their legally-binding national civil aviation regulations.

The Ministry of Transport provides aviation services such as:-

- Air Service License (ASL)
- Air Service Permit (ASP)
- Scheduled Flight Services
- Cargo Carter Flight Services by Foreign Airlines
- Passengers Carter Flight Services by Malaysia Registry Airlines
- Passenger Carter Flight Services by Foreign Airlines
- Flying School
- Flying Club
- Ground Handling Company

(vi) Malaysia Airlines (MAS)

Malaysia Airlines is the flag carrier of Malaysia and serves over 100 destinations across 6 continents from its main base at Kuala Lumpur International Airport. Its narrow body fleet comprises solely of Boeing aircraft, and its wide body fleet comprises both Boeing and Airbus

aircraft. MAS cargo is the cargo division Malaysia Airlines and operates scheduled and charter air cargo service[8].

Malaysia Airlines started in 1937 when Malayan Airways was registered in Malaya. In 1966, in recognition of its potential, the Government of Malaysia and Singapore jointly acquired majority control of the airline and named it the Malaysia-Singapore Airlines (MSA) the following year. National aspirations lead to the restructure of MSA in early 1971 and gave rise to Malaysian Airline System (MAS) in 1972. It became a public listed company in 1985 with shares quoted on the Kuala Lumpur Stock Exchange.

(vii) AirAsia

AirAsia Berhad is a Malaysian low-cost airline that operates scheduled domestic and international flights to 100 destinations spanning 22 countries. Its main hub is KLIA2 at the Kuala Lumpur International Airport (KLIA). Its affiliate airlines Thai AirAsia, Indonesia AirAsia, Philippines AirAsia, AirAsia Zest and AirAsia India have hubs in Don Mueang International Airport, Soekarno–Hatta International Airport, Ninoy Aquino International Airport and Kempegowda International Airport respectively. While its subsidiary, AirAsia X focusing on long-haul routes. AirAsia operates with the world's lowest unit cost of US$0.023 per available seat kilometers (ASK) and a passenger break-even load factor of 52%. It has achieved an aircraft turnaround time of 25 minutes and an average aircraft utilisation rate of 13 hours a day. Airasia has been described as a "pioneer" of low-cost travel in Asia. [9]

[8]Malaysia Airlines.www.centreforaviation.com
[9] Air Asia Airlines Company Background. Academia.edu.
http://www.academia.edu/4780522/AIR_ASIA_AIRLINES_COMPANY_COMPANY_BACKGROUND_Air

(viii) MAS Aerospace Engineering

MAS Engineering having operated from Subang Airport (SBZ) base from 1972, Engineering and Maintenance division of MAS expanded its operations in June 1998 to include a base at the new Kuala Lumpur International Airport (KUL) Sepang. The well-equipped engineering facilities facilitate line and light checks to be carried out in KLIA while heavy maintenance at Sultan Abdul Aziz Shah Airport, Subang (SBZ). Additionally, a base for line and light checks, located at Kota Kinabalu International Airport (BKI), is also established to support East Malaysia operations. Apart from carrying out maintenance work for MAS own fleet, MAS Engineering also actively provides line and hangar maintenance services to foreign carriers from all over the globe. To date, MAS Engineering has performed maintenance services for over 100 customers from around the world and has successfully established itself as a MRO with international recognition. MAS' Engineering global influence is further strengthened when a joint venture company, MAS GMR Aero Technic Ltd. is set up in Hyderabad, India.[10]

(ix) Malaysia Airports

Malaysia Airports is the main airports operator and manager in Malaysia, responsible for the nation's gateways to the world. Today, airports around the world are taking on multiple roles and functions. Airports are no longer just an infrastructure but have evolved to become hubs that meet the needs of travelers, be it the exceptional travelling experience or retail experience. There are some subsidiaries of Malaysia Airport which are Malaysia Airport (SEPANG) Sdn Bhd,

[10]MAS Engineering.Company Profile. www.mae.malaysiaairlines.com

Malaysia Airports Sdn Bhd and Malaysia Airports Consultancy Services Sdn Bhd.[12]

(x) STRAND Aerospace Malaysia

Since its establishment, STRAND Aerospace Malaysia has achieved major engineering services milestones in the South East Asian region. This was epitomized by the significant primary structures analysis and design work involving Airbus' flagship aircraft. STRAND Aerospace Malaysia has established itself as a key supplier of aircraft engineering design and analysis services to the global aerospace industry. The services covered by the STRAND Group include design, engineering for Continuous Product Development (CPD), certification analysis (stress analysis), manufacturing support, in-service support, aircraft structural integrity, training & development and research. The work covers both primary and secondary aircraft structures. The current portfolio includes work on wing box structures (ribs, spars and skins), pylon attachments, aileron, flaps and landing gear.

The company serves major international aeronautics clients such as Airbus UK, Airbus North America, Messier-Dowty, BAe Systems, WS Atkins Aerospace, Aerosud, GKN Aerospace, GE Aviation Services, Assystem and Composites Technology Research Malaysia. Strand Aerospace Malaysia's projects have involved the entire Airbus fleet, as well as military aircraft such as the Tornado, Harrier and Nimrod.[13]

[12]Corporate Profile.Malaysia Airports.
[13]Highlights. Strand Aerospace Malaysia Sdn Bhd. http://www.matrade.gov.my

2.6 AVIATION INDUSTRY ACTS & POLICIES IN MALAYSIA

(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 Act1974 [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 14September 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 September1971, 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 accompany, 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 1996

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, aerodomes, 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.

2.7 INTERNATIONAL BENCHMARKS FOR THE AVIATION INDUSTRY OCCUPATIONAL STRUCTURE

A "benchmark" is a comparative measurement. It is a standard or point of reference used in measuring and judging quality or value. "Benchmarking" is the process of comparison. The process of continuously comparing and measuring an organization against business leaders anywhere in the world to gain information that will help the organization take action to improve its performance. In practice it is the process of undertaking benchmarking that generates most benefits because it challenges current norms. This study has looked at several countries who have a strong presence in the global aviation industry.

2.7.1 United Kingdom

The aerospace industry of the United Kingdom is one of the largest national aerospace industry in the world. The industry employs around 113,000 people directly and around 276,000 indirectly and

has an annual turnover of around £20 billion. Domestic companies with a large presence in the British aerospace industry are such as Rolls-Royce (the world's second-largest aircraft engine maker) and Ultra Electronics. Overseas companies with a major presence include Boeing, Bombardier and the Airbus Group. UK airlines and airports carry more than 200 million passengers and over 2 million tonnes of freight every year. [14]

2.7.2 Germany

The German aviation market is a dynamic one, dominated by European giant, Lufthansa, and its host of subsidiaries, and also featuring Europe's third largest Low Cost Carrier (LCC), Air Berlin, which has, like Lufthansa, also been pursuing an acquisition strategy. The market also features an assortment of smaller LCCs, regional airlines and charter carriers. The airline market is increasingly vibrant, but it was not always so. Dominated, as it still is, by Lufthansa and its satellites, competition was severely constrained until the late 1990s, when serious competition started to arrive in the form of new airlines, delivered a new scope of life under European Union principles of open skies.[15]

However, the highly effective flag carrier still retains a 52.4% share (capacity) of the domestic market and 34.7% internationally – where, significantly, the next largest market share, of Air Berlin, is a

[14] ^ "UK Aerospace Industry Survey - 2010". ADS Group. Retrieved 11 May 2011 http://www.adsgroup.org.uk/community/dms/download.asp?txtPageLinkDocPK=23948

[15] Centre For Aviation. 2010. Germany: A dynamic market in which consolidation activity features strongly http://centreforaviation.com/analysis/germany-18890

mere 9.1%. Moreover, Lufthansa' almost blanket national market share of long-haul international operations is only slowly being eroded as Air Berlin expands into some of its more distant markets.

Now Europe's third largest LCC, Air Berlin, like Lufthansa is pursuing a path which combines organic growth and acquisitions as they expand. Lufthansa's recent acquisitions, including Swiss, Austrian Airlines, BMI and Brussels Airlines, have propelled it to becoming the largest non-US airline in the world by passenger numbers, just ahead of Air France-KLM. The great bulk of German international air travel involves holiday destinations in the Mediterranean and North Africa and this is the almost exclusive focus of the smaller German airlines, scheduled and charter.

2.7.3 Japan

Since the 1970s, civil aviation in Japan has grown steadily in terms of passenger and cargo volumes. Currently, the scale of its operations is one of the greatest in the world. According to the demand forecast for air services by the International Civil Aviation Organization (ICAO), the future growth rate in the Asian market will be the highest in the world, thus, the role of Japan in civil aviation is important. Development of airports in major metropolitan areas is currently being promoted in order to deal with the increase demand for air services. The expansion project has been launched at Tokyo International Airport, as well as the promotion of further development at Narita International Airport, Kansai International Airport and Chubu Centrair International Airport. [16]

2.7.4 United States of America

[16] Civil Aviation Bureau. Ministry of Land,Infrastructure and Transport. 2013. http://www.mlit.go.jp/koku/15_hf_000018.html

The U.S. commercial airline industry is one of the most diverse, dynamic and perplexing in the world. It is fast-evolving, labor intensive, capital intensive, hyper-competitive and highly susceptible to the ebb and flow of business cycles as well as being among the most regulated of deregulated businesses

Dramatic changes to airline industry revenues have forced management at most U.S. airlines to review many long-standing business approaches. The rapid growth of low cost carriers (LCCs) and shifts to Internet distribution channels put downward pressure on airfares and, in turn, airline revenues. Many of these changes accelerated as airline revenues began falling behind their historic relationship with the Gross Domestic Product since late 2000.[17]

In the labor negotiations during its restructuring and thereafter, the airline industry focused significant attention on total compensation - the total cost to an airline for salary and wages, pension, benefits, payroll taxes and other items affected by terms included in a collective bargaining agreement. These labor costs, which are interdependent, are key to calculating an airline's fixed cost of its respective work forces.

2.7.5 France

France’s aerospace industry, whose competitiveness has been founded through numerous European cooperation programs, is renowned throughout the world. Today, it is a leading industrial force, with a highly qualified workforce and a sizeable turnover, 75% being generated by exports, half of which come through the

[17] Global Airline Industry Program. Airline Data Project. Massachusetts Institute of Technology. http://web.mit.edu/airlinedata/www/default.html

Airbus program. The industry is involved in all sectors, with a significant impact on R&D and the balance of trade (+ €14 billion in 2008), growth and the creation of qualified jobs. Results for 2008 once again attest to the great competitiveness of the French aerospace industry, even though the economic and financial crisis starting in autumn 2008 marked the end of a growth cycle stretching back several years. The fall in air traffic and the slowdown of demand is however likely to be mitigated by the record number of orders received in recent years, guaranteeing sustained production levels. The quality of the workforce is extremely important in a sector where 50% of the positions are filled by engineers and management personnel.

The aerospace sector is structured around 10 groups that are all at the forefront of or even global leaders in their field: EADS/Airbus, the leader in civil aircraft manufacturing for the 6th year in a row; the Safran Group, which notably includes Turbomeca, the largest manufacturer in the world of helicopter engines and SNECMA, one of the leading aerospace engine manufacturers; Eurocopter, a subsidiary of EADS, the world's leading helicopter producer, with the Tiger and Puma programs in particular; Dassault Aviation, the global leader in the high-end executive aviation market with its Falcon program and a major player in military aviation with the Rafale fighter jet; Arianespace, a world leader in launching geostationary satellites; Thales Group, a world leader in critical information systems in the aerospace, defense and security markets; and Thales Alenia Space, the leading company in Europe for satellite solutions and a major player in the orbital infrastructure field. The quality of the workforce is extremely

important in a sector where 50% of the positions are filled by engineers and management personnel.[18]

2.7.6 Industry Segmentation in Other Countries

This section looks at the segmentation of the aviation industry in other countries and also looks at one example of job titles available in one of the countries in comparison to Malaysia. Below are some of the categories or main sub-sectors of the aviation industry in various countries. The different sub-sectors or areas stated in Table 2.2 are based on desktop research conducted on all the Civil Aviation Authorities in each country.

Table 2.2: Aviation Industry Segmentation in Other Countries

No	Country	Segmentation (Sub-sectors/areas)
1	United Kingdom[19]	Aircraft
		Airlines
		Airports
		Airspace
2	France [20]	Manufacturing
		Flight Operations
		Maintenance & Engineering
		Airports
3	Japan[21]	International Airport Service
		Domestic Airport Service

[18] Aerospace Industry. Invest In France. http://www.invest-in-france.org/Medias/Publications/223/Aerospace%20Industry.pdf
[19] Civil Aviation Authority . http://www.caa.co.uk/
[20] French Civil Aviation Authority. Direction générale de l'Aviation civile. http://www.developpement-durable.gouv.fr/-Secteur-Aerien,1633-.html
[21] Japan Civil Aviation Bureau. www.mlit.go.jp

No	Country	Segmentation (Sub-sectors/areas)
		Aircraft Safety
		Security
		Air Traffic Services
4	United States[22]	Aircraft
		Airport
		Air Traffic
5	Germany [23]	Aviation Safety
		Flight Operations
		Manufacturing

It can be seen from the table above, the common industry segments in other countries are as follows:

- Aircrafts
- Airports
- Flight Operations
- Manufacturing
- Air traffic
- Aircraft safety and security

The industry segmentation in other countries may serve as reference for the Aviation Industry Occupational Structure to be defined in Malaysia. However, the segmentation of the industry will also depend on the segmentation as defined by the aviation authority body in Malaysia.

2.8 CHAPTER CONCLUSION

[22] Federal Aviation Administration. http://www.faa.gov/
[23] Luftfahrt-Bundesamt (Federal Aviation Office).. http://www.lba.de/EN/LBA/LBA_node.html

It can be summarised in this chapter that the Malaysian Aviation Industry has great potential. Malaysia has many advantages and features that can be leveraged upon to make it internationally competitive. The Malaysian Government's significant investments and support in the aviation industry has achieved a major break-through and reached the pinnacle in being globally recognised.

3. METHODOLOGY

3.1 CHAPTER INTRODUCTION

This chapter describes the methodology of the overall Occupational Analysis process that will be applied throughout the Aviation industry Occupational Analysis.

3.2 RESEARCH DESIGN

The research design that consists of the research method, data analysis methods and output required is as shown in the table below:

Table 3.1: Research Design

Objective	Research Method	Data Analysis	Output
Objective 1: To identify the Occupational Structure and Occupational Area Structure of the Aviation industry	**Qualitative:** • Literature review • Focus Groups that consist of members representing different areas in the industry	• Thematic analysis • Mapping of industry job areas	• Scope of the Industry and its sub-sectors; • Occupational groups of the sub-sector; • Job title; • Critical job title; and • Competency Levels (Level 1 – 8).
Objective 2: To conduct a supply and demand analysis of the Aviation industry workforce	**Quantitative:** • Demand side data was secondary data from the Department of Statistics (DOS), this data was then referenced against the groups in the Malaysian Standards Industry Classification (MSIC) 2008	• Statistical Analysis (Linear Regression)	• Supply Analysis • Demand Analysis • Supply and Demand Gap Analysis • Projected Supply and Demand

Objective	Research Method	Data Analysis	Output
	• Supply side data was obtained from DSD, Approved Training Organisations and various Ministry of Higher Education departments		

Research initially consists of analysing available information on the Aviation Industry, followed by direct contact with those in the industry to obtain a general idea of the industry sub-sectors. A supply and demand analysis is then conducted to identify current and projected Supply and Demand including Supply and Demand gap analysis. Qualitative and quantitative analysis were selected as the methods of analysing data obtained throughout this study.

3.3 RESEARCH METHODOLOGY

This section elaborates on the different research methods used throughout the project and participating respondents. The methods utilised were focus group discussions, mapping and statistical analysis. Below are elaborations of each activity conducted with respondents.

3.3.1 Qualitative

(i) Literature review

A literature review on the Aviation Industry was carried out to get some insight of this industry in the context of the Malaysian scenario. The scope covered under this search includes definitions, the current analysis of the industry sub-sectors/areas and international examples of industry segmentation of its sub-sectors.

(ii) Focus Groups with industry members

The literature review findings were used as a guide to identify the scope of study and analysis. Experts from the Aviation Industry were identified for further communication and contact. The lists of experts are included in the list of development panel members in Annex 2: List of Development Panel Members.

In the Focus Groups with industry members, two (2) methods were adopted, namely; brainstorming and Development of Standard & Curriculum (DESCUM) session. The focus group workshop sessions are described in the following table.

Table 3.2: Focus Group Session

Date	Location	Activity	Respondents	Organisation	Method Used
4th – 5th June 2014	Silka Maytower hotel, Jalan Munshi Abdullah, Kuala Lumpur	Occupational Structure and Occupational Area Structure Analysis Workshop	8	5	Focus Group
29th August 2014	Silka Maytower hotel, Jalan Munshi Abdullah, Kuala Lumpur	Confirmation of Supply and Demand findings	5	5	Focus Group

The brainstorming and DESCUM sessions were attended by development panel members who discussed the different sub-

sectors and areas. Facts obtained during the literature review were also discussed and presented to the development panel members. The presence of the key persons or experts ensured that the development of the Occupational Analysis is current and relevant. The Aviation Industry was analysed using the above methodology to identify the following:

(a) Scope of the Industry and its sub-sectors ;

(b) Main areas;

(c) Occupational groups of the sub-sector;

(d) Job title;

(e) Critical job title; and

(f) Competency levels (Level 1 – 8).

3.3.2 Quantitative

The demand and supply data were obtained through the various sources as explained in the table below.

Table 3.3: Quantitative Analysis Data Sources

No	Type of Data	Data Sources
1	Demand data	Department of Statistics, Malaysian Standard Industry Classification codes (MSIC 2008)
2	Supply data	Skills Accredited Centres (Public & Private), Approved Training Organisations, Ministry Of Higher Education (Community Colleges , Universities)

The demand data were statistics obtained from the Department of Statistics and grouped according to the MSIC group classifications. The MSIC groups were divided according to three digit codes that described a particular group of occupations in an industry. Therefore in order to identify the relevant MSIC groups for the aviation industry, the researcher had extracted the MSIC groups relevant to the keywords; aviation and aircraft. From here, the descriptions of these groups were interpreted and mapped to the sub-sectors identified in the Occupational Structure in order to confirm the relevancy to the aviation industry. This data was then filtered according to levels of qualifications (i.e. Certificate, Diploma and Degree).

Supply data was obtained from the main training providers under skills training and academic, which were the Accredited Centres under the DSD, Approved Training Organisations under the Department of Civil Aviation and the universities under the Ministry of Higher Education.

The programmes relevant to the aviation industry were identified by searching using keywords such as aviation, aircraft and aerospace. This data was then filtered according to levels of qualifications (i.e. Certificate, Diploma and Degree) according to the graduation year between year 2011 until 2013.

3.4 DATA ANALYSIS

In order to come up with the outcome for the first objective of this study (Objective 1: Occupational Structure and Occupational Area Structure), the data was analysed through mapping, synthesis of discussion group findings and comparison of benchmarking samples. Whereas to produce

the results required for the second objective (Objective 2: Supply and Demand Analysis), statistical analysis was applied. The data analysis methods are explained in the next section.

3.4.1 Qualitative Analysis: Occupational Structure and Occupational Area Structure Development

Thematic analysis was used in qualitative research and focused on examining themes within data. This method emphasizes organization and rich description of the data set. Thematic analysis goes beyond simply counting phrases or words in a text and moves on to identifying implicit and explicit ideas within the data. Coding is the primary process for developing themes within the raw data by recognizing important moments in the data and encoding it prior to interpretation. The interpretation of these codes can include comparing theme frequencies, identifying theme co-occurrence, and graphically displaying relationships between different themes. Most researchers consider thematic analysis to be a very useful method in capturing the intricacies of meaning within a data set.

The thematic approach was applied throughout the process of analysing the Occupational Structure of the industry. The Occupational Structure was analysed and defined based on the following processes:

(a) 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 to other relevant industries. This will eliminate the possibility of duplication between common areas.

The rule of thumb is to avoid taking into account the organization chart as this will include many other industries 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 based on similar skill sets in terms of technical abilities is a determining factor.

(b) 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.

(c) Identification of job titles

In order to identify job titles, it is important to obtain consensus from expert panel members so that the job title is common between organizations either Small, Medium Enterprise (SME) or Multi National Corporations and is easily accepted by practitioners in the industry.

(d) Identification of Leveling

Leveling of a job title is done based on the level of competency required to be deemed competent at a specific designation.

The level descriptors in Annex 1 is used as reference when determining the different levels relevant to a specific job title.

(e) Occupational Area Analysis

The Occupational Structure can be further analysed to produce its Occupational Area Structure (OAS) through Occupational Area Analysis (OAA). The occupational area analysis is a process of analysing the job scope of a particular area. This will help to ensure that the job titles are described not only based on common use in the industry but also by their job scope. These OAS will be taken into consideration to be developed into NOSS sub-areas. Therefore the process of merging and shrinking must be done with keeping in mind of the mechanisms of training and certification based on the NOSS. Ultimately, we are able to produce multi-skilling and multi-tasking workers required by the industry in line with the high income economy policy. Nevertheless, in certain cases, due to the requirement of industry or regulations, merging is not necessarily required.

3.4.2 Quantitative : Statistical Analysis

The techniques applied for the Supply and Demand Analysis were through statistical analysis. The data used for the supply and demand analysis comes from two primary sources:

i. Supply-side data comes from the Department of Skills Development for Malaysian Skills Certification data, Higher Learning Institution for both public and private and the departments related to community colleges and universities. This data includes completers of all educational or training programs.

ii. Demand-side data comes from the Department of Statistics Malaysia which is mapped to the Malaysian Standard Industry Classification codes (MSIC 2008). The MSIC is based on standard occupational categories to quantify labor in the respective industry sectors. These two sources are statistically reliable quantitative sources of supply and demand information available.

Statistical techniques were applied to develop datasets that inform workforce planning decisions. Below are the techniques applied when analysing the statistical data:

i. Supply Analysis

Supply data was analysed by aggregate, levels of qualifications and by year of graduation.

ii. Demand Analysis

Demand data was analysed by aggregate, level of qualifications according to their respective years of entry into the workforce. After obtaining the numbers of workers for a particular year, in order to obtain the demand value, the data of the current year is subtracted from the previous year, for example:

Demand = Number of workers for current year – Number of workers for previous year

The product of the above formula when found to be positive shows an increase of workers in the industry for a particular level of qualification and negatives show that there might have occurred either termination of workers or migration of workers from the industry to other industries.

The demand data was also mapped to the sub sectors of the Occupational Structure in order to analyse the relevancy of the demand data according to the different job areas.

i. Supply and Demand Analysis

In order to identify the supply and demand gap, the following formula was applied:

Supply and Demand Gap for Year X
= Supply Data for Year X - Demand Data for Year X

The product of the above formula when positive was considered as Oversupply and when negative was considered as Undersupply of graduates for a particular occupational area.

ii. Projected Supply and Demand Analysis

Linear regression was specifically used in the supply and demand analysis for this industry where the time trend was drawn from data in year 2011 until year 2013 and projected until the year 2020. Extrapolation was used to project the future supply and demand for workers in the industry by entry qualification such as certificate, diploma and degree and aggregate.

The current workforce demographics are compared with previous years, in this study, data from the previous 3 years were analysed to see how they have changed and determine previous trends.

The regression analysis includes techniques for analysing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps one understand how

the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed.

Regression models can predict a value of the 'Y' dependent variable given known values of the 'X' independent variables. Prediction within the range of values in the dataset used for a model is known as interpolation. Prediction outside the range of the dataset is known as extrapolation. Performing extrapolation relies strongly on the regression assumptions and model. Regression analysis is generally more reliable the more data is included in the regression model. The further the extrapolation goes outside the data, the more room there is for the model to fail due to differences between the assumptions and the dataset.

3.5 LIMITATIONS

i. MSIC occupational classifications broader than Occupational Structures sub-sectors

The standard occupational groups defined in MSIC are broader than the sub-sectors as highlighted in the Aviation Industry Occupational Structures. This is taken into account in the interpretation of the findings .

ii. Difficulty in obtaining supply data

Due to certain technical issues with the private higher learning department's information system at the point of research, the data for the private universities could not be extracted for the year 2012 and 2013, where only data for the year 2011 could be provided.

Another limitation was that not all ATO data statistics were centralised and most of the trainees were already employees of certain airlines or airport management organisations, therefore the data was not included as potential supply as they were already attached to these organisations.

3.6 CHAPTER CONCLUSION

This chapter has elaborated on the methodology used in the study which is through literature review, focus group discussion sessions, DESCUM (Development of Standard and Curriculum), focus groups and regression analysis techniques. The development of the OS obtained via brainstorming sessions and supply and demand findings will be presented in the next chapter, Chapter 4, Findings and Discussion.

4. FINDINGS AND DISCUSSION

4.1 CHAPTER INTRODUCTION

The identified sub-sectors for the Aviation industry were obtained through discussions with industry experts during the development workshop sessions and interviews. Based on the discussions held during development workshops, the development panel members had identified that the Aviation industry in Malaysia is defined to be segregated into 5 sub-sectors which are Air Cargo Handling, Ground Handling, Airport Operation & Management, Maintenance Repair Overhaul (MRO) and Airline Operation.

4.2 AVIATION INDUSTRY OCCUPATIONAL STRUCTURE

The identified sub-sectors for the Aviation industry have been obtained through literature research and further discussed with industry experts during the development workshop sessions.

The Occupational Structures for these sub-sectors are included in this section that show the common job titles in the industry. Following the Occupational Structure framework is the Occupational Area Structure that depicts the common job scope for each of the areas as defined in their respective occupational structures. In the Occupational Area Analysis, sub-areas under the same area may be combined if the job scope is similar. This is to show the common responsibilities of the personnel regardless of job title, as job titles may vary between different institutions and organisations.

The identified sub-sectors for the aviation industry were obtained through literature research and discussions with industry experts during the development workshop sessions and interviews. Based on the discussions held during development workshops and approval sessions, the

development and approval panel members had identified that the main sub-sectors under the Aviation Industry in Malaysia were to be segregated into 5 different sub-sectors which are:

a) Air cargo handling
b) Ground handling
    i. In-Flight Catering Support Services
    ii. Ramp Services
    iii. Passenger Services
    iv. Ground Support Equipment Services
c) Airport operation and management
    i. Airside Operation
    ii. Landside Operation
    iii. Terminal Operation
d) Maintenance, Repair and Overhaul (MRO)
    i. Aviation Maintenance
    ii. Aircraft Structure Engineering
    iii. Aviation Manufacturing
e) Airline operation
    i. Operation Despatch
    ii. Cabin Crew
    iii. Flight Crew

Please refer Figure 4.1 for the Overall Structure of the Aviation Industry. The detailed Occupational Structures for these sub-sectors are included in this section that show the common job titles in the industry and are presented under each relevant sub-sector and area.

Following each Occupational Structure framework is an Occupational Area Structure that depicts the common job scope for each of the areas as defined in their respective occupational structures. In the Occupational

Area Analysis, sub-areas under the same area may be combined if the job scope is similar. This is to show the common responsibilities of the personnel regardless of job title, as job titles may vary between different institutions and organisations. The overall Occupational Structure can be referred in Annex 3.

Below are the descriptions of each of the different sub-sector and area;

a) Air Cargo Handling

Air Cargo handling involves storing equipment or vehicles, which do not form part of the aircraft, either part of or its entire payload. It also means the goods received at the airline's handling agent warehouse. The handling agent will often be a separate company contracted by the airline, but cargo handling can also be an in-house function of the airline, especially at a major hub. Depending on the kind of goods, destination and urgency, delivery at the handling agent has to be done within a certain norm-time before departure (TBD) of the aircraft, called a slot or a slot-time. The air cargo handling process involves several major stages such as air cargo operation, cargo administration and cargo management. Personnel under this area start at Level 2 as Air Cargo Handling Personnel, and Level 3 as Air cargo Handling Officer/Supervisor, and then they may proceed to Level 4 as Cargo Executive where they may proceed to Level 5 as Cargo Manager.

The Air cargo operation supervisor is responsible to supervise and coordinate the activities of ground crew in the loading, unloading, securing, and staging of aircraft cargo. He or she may also determine the quantity and orientation of cargo. They also may accompany aircraft as member of flight crew and monitor and handle cargo in flight. Some tasks which air cargo officer/supervisor must be done are

to distribute cargo in such a manner that space use is utilized. He or she uses charts and computers, to direct ground crews in the loading, unloading, securing, or staging of aircraft cargo, to determine the quantity and orientation of cargo.

Cargo administration is defined by activities to expedite and route movement of incoming and outgoing cargo and freight shipments in airline. Cargo handling personnel may take orders from customers and arrange pickup of freight and cargo for delivery to loading platform. He or she also may prepare and examine bills of lading to determine shipping charges and tariffs.

The Cargo management job scope is a vital part of the Cargo supply chain process. A Cargo Manager may oversee the efficient receipt, storage and dispatch of a wide range of all Cargo products. A Cargo Manager is responsible in managing people, processes, equipment, work tools, systems and available resources to ensure productivity targets are met with cost effectiveness. He or she may also maintain computerized administration, automated storage, retrieval systems, workplace health and safety requirements are met and take responsibility for the security of the warehouse and stock. They are also involved in recruitment, training, planning, administration and general management issues of air cargo handling.

b) Ground Handling

Under the aviation industry, ground handling defines operation of an aircraft while it is on the ground and (usually) parked at a terminal gate of an airport. Ground handling consists of 4 job areas which are:

- In-Flight Catering Support Services;
- Passenger Services;
- Ground Support Services; and
- Ramp Services.

i) In-flight catering support services

In-flight catering support services activities is unloading of food and drink from the aircraft, and the loading of fresh food and drink for passengers and crew. In-flight catering services personnel may empty or trash-filled trolley from the previous flight and replace with fresh ones. Meals are prepared mostly on the ground in order to minimise the amount of preparation (apart from chilling or reheating) required in the air. In fact, there are several different kinds of food service employees who work for an airline just like there are at restaurants. He or she are prepare the food as well as the silverware and dishes for outgoing flights, wash dishes from incoming flights, and ensure that kitchen operations run smoothly and efficiently. He or she also prepares meals for flights, but the entirety of their work takes place on the ground in an airport flight kitchen. In-flight catering support services supervisor may establish and maintain good communications with airline personnel in charge of passenger food service is essential. He or she has to know the kitchen amenities available on specific flights to make sure passenger requests dishes easily prepared and quickly served. If special dietary concerns are noted, it is necessary for the in-flight

catering support services supervisor to have an arsenal of recipes on hand to accommodate those needs. He or she should inform airline caterer to maintain a daily inventory of food items to meet customer needs. In-flight catering manager leads the In-flight Services function and heads in managing the performance of cabin crew, catering, in-flight catering operations, and inventory control. He or she also may ensure the documentation and implementation pertaining to Cabin Services are fully met objectives and compiles annual budget for In-flight.

ii) Passenger services

Passenger services means services inside the airport terminal such as:

- Providing check-in counter services for the passengers departing on the customer airlines.
- Providing gate arrival and departure services. The agents are required to meet a flight on arrival as well as provide departure services including boarding passengers and closing the flight.
- Staffing the transfer counters, customer service counters and airline lounge.

Passenger services personnel are responsible in responding to abnormal conditions such as passengers needing special assistance, oversold flights, missed connections, heavy passenger concentration to expedite loading or unloading of passengers. The passenger service personnel may also perform the duties of ticket agent and supervise the ticket office information to passenger. He or she may also supervise the check-in process to make sure that procedures and regulations are followed. They also must make sure that passenger and baggage flows are maintained. Passenger

service personnel/officer may ensure that staff, as well as passengers have up-to-date information about flights deal with passenger complaints. They also may supervise the handling of problems with lost, damaged or misdirected property on behalf of airlines and provide assistance to passengers with special needs, such as disabled and elderly passengers, and children who are travelling unaccompanied by an adult. They also may supervise the executive lounge operation and help passengers who are facing delays, including arranging refreshments, meals, accommodation or arranging coach transport to another airport. Passenger service executive may allocate staff to jobs on a rota basis and provide cover for staff absent due to holiday and sickness. He or she may also recruit and train staff, keep records and write reports. They also may ensure health and safety standards are achieved to keep staff and passengers safe in the airport. The passenger services manager is responsible for the smooth running of passenger services at airports. They manage passenger services staff, including check-in staff, ticket desk agents and customer service agents.

iii) Ramp Services

Ramp services focus on the ramp and service the exterior of the aircraft, wash, and polish the aircraft. They must stand on scaffolding or ride special lift equipment to reach high places. Although usually in a hangar, ramp services personnel sometimes work outdoors. The heaviest work schedules are at night, when most aircraft are not in service. Ramp services personnel work on shift schedule. A ramp services Manager is responsible to organize, direct, and coach passenger service and or fleet service agents at the airport. He or she may also handle customer service challenges. Ramp services supervisor/officer help to develop and

coach agents regarding correct policies, procedures, and customer handling. He or she may also manage the daily activities of passenger service and/or fleet service agents. They also may resolve escalated customer service issues and consistently implement and enforce policies and procedures. Ramp services officers may communicate with employees regarding customer service issues.

iv) Ground Support Equipment Services

Ground Support Equipment (GSE) is the support equipment found at an airport, usually on the ramp, the servicing area by the terminal. This equipment is used to service the aircraft between flights. As its name implies, ground support equipment is there to support the operations of aircraft whilst on the ground. The functions this equipment plays generally involve ground power operations, aircraft mobility, and loading operations (for both cargo and passengers).

c) Airport Operation and Management

An airport is a defined area on land or water (including any building, facilities and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Airport operations management consists of Landside operations, Terminal Operations and Airside operations. The Landside, Terminal and Airside area are segregated by functions and activities according to the national and International Civil Aviation Organisations (ICAO) Standard and Recommended Practices (SARPs).

“Landside” means that area of an airport and any building to which the non-travelling public has free access. Landside operations activities

include car park, public transportation, access roads and airport land boundary.

"Terminal" means that area of an airport building where passengers transfer between transportation and the facilities that allow them to board and disembark from aircraft. Terminal operations activities includes commercial activities, air ticket purchasing, passenger check in process, baggage transfer, aviation security screening, and customs, immigration and quarantine clearances.

"Airside" area means that part of the airport used for the surface movement of aircraft, including those areas used for take-off, landing and taxing of aircraft, and the apron area used for the purpose of loading and unloading of passengers and cargo and refuelling, parking and carrying out of maintenance of aircraft, being declared a "security area" by the regulator.

It has also been agreed during discussions with the development panel and evaluating panel that the job area of Air Traffic Control is included under the Airside area. However, the training and licensing of the personnel for Air Traffic Control personnel must be under the jurisdiction of the relevant authority body, which is the Department of Civil Aviation, Malaysia.

d) Maintenance, Repair and Overhaul (MRO)

Maintenance, Repair and Overhaul (MRO) consists of three job areas which are aviation maintenance, aircraft engineering and Aviation Manufacturing.

i) Aviation Maintenance

An Aircraft Mechanic is certifying personnel that permit the holder to issue certificates of release to services following minor scheduled line maintenance and simple defect rectification within the limits of tasks specially endorsed on the authorization. The certification privileges are restricted to work that the authorization holder has personally performed. The certification privileges are divided to turbine engine, piston engine, airframe and avionic.

The Aircraft Technician is certifying personnel that permits the holder to issue certificates of release to services following line maintenance, including aircraft structure, power-plant and mechanical and electrical system. Replacement of avionic line replaceable units, requiring simple tests to prove their serviceability, is also included in the privileges.

Whereas the Aircraft Engineer is certifying personnel that permits the holder to issue certificates of release to services following line and base maintenance. The authorization is valid for the aircraft in its entirely, including all systems.

The Maintenance Foreman is responsible to interpret plans, perform tasks in accordance of Certificate of Release Services – Schedule Maintenance Inspection (CRS-SMI) requirement and provide advice on engineering methods and procedures to achieve maintenance and production requirements. They work out and put into place project and work schedules and budgets.

The Maintenance Superintendent is responsible for the efficient operation of the aircraft maintenance facility including scheduling

and budgeting. They will also oversee the work of engineering maintenance staff. They might also be responsible for liaison with customers (airlines etc.), contractors and suppliers. The Maintenance Superintendent may direct the formulation of engineering strategies, policies and plans. They may also ensure engineering standards of quality, cost, safety, timeliness and performance are met. They also must make sure that there is conformity with specifications and plans and with laws, regulations and safety standards. They may also oversee maintenance requirements to optimise efficiency. He or she may also coordinate the activities of engineering staff and control engineering staff selection and training.

ii) Aircraft Engineering

Aircraft structure engineering consists of sheet metal workshop, galley workshop, flight control balancing, composite, non-destructive testing, aviation painting and aviation welding. As for the Avionic sub area, the personnel may start their career at level 1 as avionic mechanic. The Avionic job area requires them to work on the aviation electronic parts on the modular system. Under the avionic sub area, the Avionic Mechanic is certifying personnel authorisation that permits the holder to issue certificates of release to services – aircraft repair component (CRS-ARC) following minor scheduled workshop maintenance and simple defect rectification within the limits of tasks specially endorsed on the authorisation. The certification privileges are restricted to work that the authorization holder has personally performed.

The Avionic Foreman is responsible to interpret plans, perform task accordance of certificate of release services – schedule

maintenance inspection (CRS-SMI) requirement and provide advice on engineering methods and procedures to achieve maintenance and production requirements. They work out and put into place project and work schedules and budgets.

The Avionic Superintendent is responsible for the efficient operation of the aircraft maintenance facility including scheduling and budgeting. They will also oversee the work of engineering maintenance staff. They might also be responsible for liaison with customers (airlines etc.), contractors and suppliers. Maintenance Superintendent may direct the formulation of engineering strategies, policies and plans. They may also ensure engineering standards of quality, cost, safety, timeliness and performance are met. They also must make sure that there is conformity with specifications and plans and with laws, regulations and safety standards. Maintenance Superintendent may also oversee maintenance requirements to optimise efficiency. He or she may also coordinate the activities of engineering staff and control engineering staff selection and training.

The Avionic Technician is certifying personnel authorisation that permits the holder to issue certificates of release to services following line maintenance, including navigation, communication, propulsion, radar and electronic. Replacement of avionic line replaceable units, requiring simple tests to prove their serviceability, is also included in the privileges.

The Avionic Engineer is certifying personnel authorization that permits the holder to issue certificates of release to services following line and base maintenance on avionic and electronic system.

The Maintenance Foreman is responsible to interpret plans, perform tasks in accordance of certificate of release services – schedule maintenance inspection (CRS-SMI) requirement and provide advice on engineering methods and procedures to achieve maintenance and production requirements. They work out and put into place project and work schedules and budgets.

Maintenance Superintendent is responsible for the efficient operation of the aircraft maintenance facility including scheduling and budgeting. They will also oversee the work of engineering maintenance staff. They might also be responsible for liaison with customers (airlines etc.), contractors and suppliers. Maintenance Superintendent may direct the formulation of engineering strategies, policies and plans. They may also ensure engineering standards of quality, cost, safety, timeliness and performance are met. They also must make sure that there is conformity with specifications and plans and with laws, regulations and safety standards. Maintenance Superintendent may also oversee maintenance requirements to optimise efficiency. He or she may also coordinate the activities of engineering staff and control engineering staff selection and training.

iii) Aviation Manufacturing

This area is divided into Modification and Aviation Production. Under the Modification sub-area, the personnel enters at Level 1 and may proceed until the highest level of competency at Level 7. Below are elaborations of the job titles under this pillar.

- **Aircraft Structure Mechanic**

  Aircraft Structure Mechanic is certifying personnel who is permitted to issue certificates of release to services (CRS-ARC)

following minor scheduled simple defect rectification within the limits of tasks specially endorsed on the authorization. The certification privileges are restricted to work that the authorization holder has personally performed.

- **Aircraft Structure Technician**

  Aircraft Technician is certifying authorisation personnel who is permited to issue certificates of release to services (CRS-ARC) following line and base maintenance, including primary and secondary structure repair and modification.

- **Aircraft Structure Engineer**

  Aircraft Structure Engineer is certifying personnel who is permitted to issue certificates of release to services (CRS-ARC) following line and base maintenance on primary and secondary structure repair and modification.

- **Aircraft Structure Specialist**

  Aircraft Structure Specialist is certifying personnel who is permitted to issue certificates of release to services (CRS-ARC) following line and base maintenance on primary structure replacement. The authorization is valid for the aircraft in its entirety, including all mechanical and avionic modification.

- **Aircraft Structure Superintendent**

  They will also oversee the work of Aircraft Structure Modification staff. They might also be responsible for liaison with customers (airlines etc.), contractors and suppliers. The Superintendent may direct the formulation of strategies, policies and plans. They may also ensure standards of quality, cost, safety, timeliness and performance are met. They also

must make sure that there is conformity with specifications and plans and with laws, regulations and safety standards.

e) Airline Operation

Airline Operation consists of 3 Job Areas which are Operation Despatch, Cabin Crew and Flight Crew. Flight crew job area has 3 sub sectors which are wide body, narrow body and general aviation. General aviation can be divided into two categories which are rotary and fixed wing.

i) Operation Despatch

Operation despatch personnel may include equal and joint responsibility with the pilot in command for the safety and operational control of the flight. They are responsible for the economics, operational control, and passenger service requirements for daily flight operations. Operation despatch officers review weather information, aircraft position reports, aeronautical navigation charts and aircraft radio calls to determine potential flight safety hazards and to select the preferred and most economical route of flight. In order to make these decisions, they must identify the amount of fuel required, distance of flight, maintenance limitations, weather conditions, and other factors affecting safety of flight using company and international established guidelines.

Operation despatch personnel are responsible for preparing flight plans with information including maximum allowable takeoff and landing weights, weather reports, field conditions, and other information required for the safe completion of the flight. They may advise the pilot in command of significant changes to weather or the flight plan and recommend changes as required for the continued safe operation of the flight and will assist the pilot in command of an

aircraft with an emergency situation by providing any assistance necessary to ensure safe completion of the flight.

ii) Cabin Crew

Cabin crew is another job scope of airlines operation. The role of an air cabin crew member is to provide excellent customer service to passengers while ensuring their comfort and safety throughout the flight. They are trained to deal with security and emergency situations which may arise and can administer first aid to passengers. Cabin crew ensure that all emergency equipment is in working order prior to take off and that there are enough supplies. They also help passengers to board the plane and give a demonstration of safety procedures and equipment.

Cabin crew may work on short or long-haul flights. There are some typical work activities of cabin crew which are attending a pre-flight briefing, during which air cabin crew are assigned their working positions for the upcoming flight.

Crew are also informed of flight details, the schedule and if there are passengers with any special requirements, such as diabetic passengers, passengers in wheelchairs or the number of infants on board; carrying out pre-flight duties, including checking the safety equipment and security checks, ensuring the aircraft is clean and tidy, ensuring that information in the seat pockets is up to date and that all meals, drinks and stock are on board; welcoming passengers on board and directing them to their seats; informing fliers of the aircraft safety procedures and ensuring that all hand luggage is securely stored away; checking all seat belts and galleys are secure prior to take-off; making announcements on behalf of the pilot and answering questions during the flight; serving meals and refreshments; selling duty-free goods and

advising passengers of any allowance restrictions in force at their destination; reassuring passengers and ensuring that they follow safety procedures correctly in emergency situations; giving first aid where necessary; ensuring passengers disembark safely at the end of a flight and checking that there is no luggage left in the overhead lockers and no stowaways or suspicious items on board; completing paperwork, including writing a flight report.

The Chief cabin crew acts as a leader and is responsible for leading the cabin crew team onboard, taking responsibility for the cabin operation, for the associated customer experience and for promoting teamwork. The Chief cabin crew ensures the safe and consistent delivery of a quality onboard service through the continuous performance management of cabin crew in accordance with company and regulatory policies and procedures, carrying out performance assessments on crew as required.

iii) Flight Crew

As for flight crew, the area is divided into wide body, narrow body and general aviation. The responsibilities require them to navigate the flight of fixed-wing, multi-engine aircraft, usually on scheduled air carrier routes, for the transport of passengers and cargo.

To be a pilot or commander, they are required to be licensed. Some of their tasks are to work as part of a flight team with other crew members, especially during take-offs and landings. They also use instrumentation to guide flights when visibility is poor. They may start engines, operate controls, and pilot airplanes to transport passengers, mail, or freight, adhering to flight plans, regulations, and procedures. They also may contact control towers for takeoff clearances, arrival instructions, and other information, using radio equipment and also

monitor gauges, warning devices, and control panels to verify aircraft performance and to regulate engine speed. Pilots respond to and report in-flight emergencies and malfunctions and may also steer aircraft along planned routes, using autopilot and flight management computers. They will check passenger and cargo distributions and fuel amounts to ensure that weight and balance specifications are met and also may monitor engine operation, fuel consumption, and functioning of aircraft systems during flights. They also inspect aircraft for defects and malfunctions, according to pre-flight checklists.

For general aviation, the personnel are responsible to navigate the flight of fixed-winged aircraft on non-scheduled air carrier routes, or helicopters. This job requires a Commercial Pilot certificate and includes charter pilots with similar certification, and air ambulance and air tour pilots. They are some general tasks which are to check aircraft prior to flights to ensure that the engines, controls, instruments, and other systems are functioning properly. They also may contact control towers for takeoff clearances, arrival instructions, and other information, using radio equipment. They may also start engines; operate controls, and pilot airplanes to transport passengers, mail, or freight according to flight plans, regulations, and procedures. They have to monitor engine operation, fuel consumption, and functioning of aircraft systems during flights. In fact, they may consider airport altitudes, outside temperatures, plane weights, and wind speeds and directions to calculate the speed needed to become airborne. They also may order changes in fuel supplies, loads, routes, or schedules to ensure safety of flights and also may obtain and review data such as load weights, fuel supplies, weather conditions, and flight schedules to determine flight plans and identify needed changes. They also may plan flights according to government and company regulations, using aeronautical charts and navigation instruments.

4.3 AVIATION INDUSTRY OCCUPATIONAL AREA ANALYSIS

The Occupational Area Analysis is done so that the current job titles in the industry are translated into the job scope required of the personnel. In doing so, candidates will have better employment prospects as there will be no mismatch of job titles to expected job competencies. This is because different organisations use different job titles. Certification will also be able to reflect the job competencies correctly and avoid confusion of job scope based on job titles. The Occupational Area Structures can be referred in Annex 4 of this report.

For Air Cargo Handling job areas, it has been analysed by expert panel members that personnel start their careers at Level 2 where they require a level of decision making and problem solving in order to be efficient in fast paced and time critical situations. The competencies at level 2 and 3 are merged to become Air Cargo operation, where they may progress to higher levels such as Cargo Administration at level 4 and Cargo Management at level 5 respectively.

For each of the Ground Handling areas, the personnel's job scope cover operation work at Level 2 and Level 3, Administration work at Level 4 and Management work at Level 5.

For Airport Operation and Management sub-sector, this job area consists of 3 areas which are Landside Operation, Airside Operation and Terminal Operation. For this sub area, they may start their career with operation work at Level 2 and 3. Personnel at Level 4 assist in terms of supervising smooth operation at the airport. All sub areas may progress until Level 5 in management work.

For the Maintenance, Repair and Overhaul job area, they are divided into Aircraft Engineering, Aviation Maintenance and Aviation Manufacturing. The personnel who work under this area may start at Level 1 being responsible for Operations, at Level 2 in Technical Operation and at Level 3 for Operation Supervision . At Level 4 they are responsible for Engineering, at Level 5 for more specialised engineering and at Level 6 are responsible for authorization. At Level 7 these personnel will be responsible for the respective areas of management. This job area also requires them to take the Licensed Aircraft Engineer (LAE) license when they reach at Level 5.

For the airline operation job area, it consists of 3 sub areas which are operation despatch, cabin crew and flight crew. For operation dispatch, these personnel may start at level 3 as operation despatch officer. They may work up to level 5 as an operation dispatch manager. For cabin crew job area, they may start work at level 2 and further until level 4 as in-flight supervisor. For flight crew job area, they consist of wide body, narrow body and general aviation sub area. For Wide body, Narrow body and General Aviation, the personnel may start at level 3 as Second Officer, then proceed till level 4 and level 5 as First Officer and Senior First Officer respectively. At level 6 as Captain and up until level 7 as Commander. This job area requires competencies of operating the engine, air system, electric system, navigation, geographical area, passenger comfort, operation of aircraft, weight and loading calculation and leadership management.

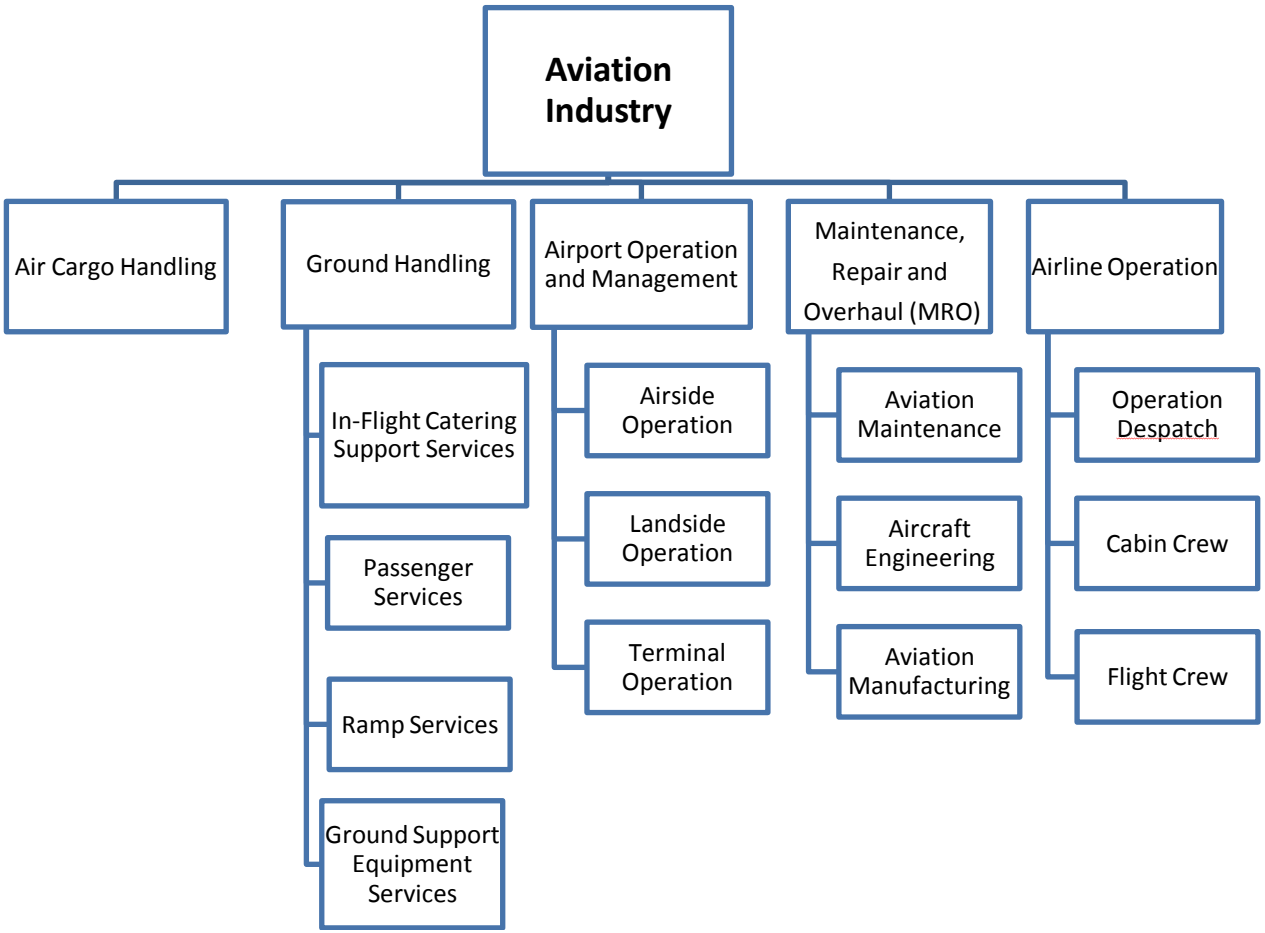


Figure 4.1 : Overall Structure of Aviation Industry

Table 4.1 : Occupational Structure for the Aviation Industry – Air Cargo Handling Sub sector

Sector	Aviation Industry
Sub Sector	Air Cargo Handling
Job Area	
Sub Area/Level	
8	*No Level*
7	*No Level*
6	*No Level*
5	Air Cargo Manager
4	Air Cargo Executive
3	Air Cargo Officer/Supervisor
2	Air Cargo Handling Personnel*
1	*No Level*

*** Critical Job Titles**

Table 4.2 : Occupational Structure for the Aviation Industry – Ground Handling Sub sector

Sector	Aviation Industry				
Sub Sector	Ground Handling				
Job Area / Sub Area/Level	In-Flight Catering Support Services	Passenger Services	Ramp Services	Ground Support Equipment Services	
				Mechanical	Avionic
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
6	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
5	*No Level*	Passenger Services Manager	Ramp Services Manager	Aircraft Ground Support Equipment Manager	Aircraft Ground Support Equipment Manager
4	In-Flight Catering Support Services Officer	Passenger Services Executive	Ramp Services Executive	Aircraft Ground Support Equipment Executive	Aircraft Ground Support Equipment Executive
3	In-Flight Catering Support Services Supervisor*	Passenger Services Supervisor / Officer*	Ramp Services Supervisor/ Officer*	Aircraft Ground Support Equipment Supervisor	Aircraft Ground Support Equipment Supervisor
2	In-Flight Catering Support Services Personnel*	Passenger Services Personnel*	Ramp Services Personnel*	Aircraft Ground Support Equipment Technician	Aircraft Ground Support Equipment Technician
1	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*

*** Critical Job Titles**

Table 4.3 : Occupational Structure for the Aviation Industry – Airport Operation & Management Sub sector

Sector	**Aviation Industry**		
Sub Sector	**Airport Operation & Management**		
Job Area / **Sub Area/Level**	**Landside Operation**	**Airside Operation**	**Terminal Operation**
8	*No Level*	*No Level*	*No Level*
7	*No Level*	*No Level*	*No Level*
6	*No Level*	*No Level*	*No Level*
5	Landside Senior Executive	Airside Senior Executive	Terminal Operation Senior Executive
4	Landside Executive	Airside Executive	Terminal Operation Executive
3	Landside Supervisor/ Officer	Airside Supervisor/ Officer	Terminal Operation Supervisor/Officer*
2	Landside Personnel*	Airside Personnel*	Terminal Operation Personnel*
1	*No Level*	*No Level*	*No Level*

*** Critical Job Titles**

Table 4.4 : Occupational Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) sub sector – Aviation Maintenance

Sector	Aviation Industry							
Sub Sector	Maintenance Repair Overhaul (MRO)							
Job Area	Aviation Maintenance							
Sub Area/Level	Rotary Wing				Fixed Wing			
	Airframe	Piston Engine	Turbine Engine	Avionic	Airframe	Piston Engine	Turbine Engine	Avionic
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)	Avionic Foreman (Rotary Wing)	Airframe Foreman (Fixed Wing)	Piston Engine Foreman (Fixed Wing)	Turbine Engine Foreman (Fixed Wing)	Avionic 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)

*** Critical Job Titles**

Table 4.4 : Occupational Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) – Aircraft Engineering Sub sector

Sector	Aviation Industry							
Sub Sector	Maintenance Repair Overhaul (MRO)							
Job Area	Aircraft Engineering							
Sub Area/Level	Aircraft Structure Engineering							
	Sheet Metal Workshop	**Galley Workshop**	**Flight Control Balancing**	**Composite Workshop**	**Non Destructive Testing (NDT)**	**Aviation Painting**	**Aviation Welding**	**Technical Services**
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	Sheet Metal Superintendent	Galley Superintendent	Flight Control Superintendant	Composite Superintendant	NDT Superintendant	Painting Superintendent	Welding Superintendent	Technical Services Superintendant
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	*No Level*
1	Sheet Metal Mechanic*	Galley Mechanic	Flight Control Balancing Mechanic	Composite Mechanic	NDT Assistant Technician (Level I)	Assistant Painting	Assistant Welding	*No Level*

*** Critical Job Titles**

Table 4.4 : Occupational Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector (Aircraft Engineering)

Sector	Aviation Industry						
Sub Sector	Maintenance Repair Overhaul (MRO)						
Job Area	Aircraft Engineering						
Sub Area/Level	Avionic						
	Electrical	Electronic	Instrument	Auto Pilot	Navigation	Radar	Radio
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	Electrical Superintendant	Electronic Superintendant	Instrument Superintendant	Auto Pilot Superintendant	Navigation Superintendant	Radar Superintendant	Radio Superintendant
6	Electrical Foreman	Electronic Foreman	Instrument Foreman	Auto Pilot Foreman	Navigation Foreman	Radar Foreman	Radio Foreman
5	Electrical Specialist	Electronic Specialist	Instrument Specialist	Auto Pilot Specialist	Navigation Specialist	Radar Specialist	Radio Specialist
4	Electrical Engineer	Electronic Engineer	Instrument Engineer	Auto Pilot Engineer	Navigation Engineer	Radar Engineer	Radio Engineer
3	Electrical Supervisor	Electronic Supervisor	Instrument Supervisor	Auto Pilot Supervisor	Navigation Supervisor	Radar Supervisor	Radio Supervisor
2	Electrical Technician	Electronic Technician	Instrument Technician	Auto Pilot Technician	Navigation Technician	Radar Technician	Radio Technician
1	Electrical Mechanic	Electronic Mechanic	Instrument Mechanic	Auto Pilot Mechanic	Navigation Mechanic	Radar Mechanic	Radio Mechanic

Table 4.4 : Occupational Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector (Aircraft Engineering) Continued

Sector	Aviation Industry		
Sub Sector	Maintenance Repair Overhaul (MRO)		
Job Area	Aircraft Engineering		
Sub Area/Level	Aviation Calibration	Flight Simulator Calibration	Manufacturing Design
8	*No Level*	*No Level*	*No Level*
7	Calibration Testing Analysis Superintendent	Flight Simulator Superintendent	Manufacturing Design Consultant
6	Calibration Testing Analysis Foremen	Flight Simulator Designer	Manufacturing Designer
5	Calibration Testing Analysis Specialist	Flight Simulator Specialist	Manufacturing Design Specialist
4	Calibration Testing Analysis Engineer	Flight Simulator Engineer	Manufacturing Design Programmer
3	Calibration Testing Analysis Supervisor	Flight Simulator Supervisor	Manufacturing Design Supervisor
2	Calibration Testing Technician	Flight Simulator Technician	Manufacturing Design Technician
1	Calibration Testing Mechanic	*No Level*	*No Level*

Table 4.4 : Occupational Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector (Aircraft Engineering) Continued

Sector	Aviation Industry										
Sub Sector	Maintenance Repair Overhaul (MRO)										
Job Area	Aircraft Engineering										
Sub Area/ Level	Mechanical										
	Cabin Interior	Hydraulic	Oxygen	Pneumatic	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*
7	Cabin Interior Superintendant	Hydraulic Superintendant	Oxygen Superintendant	Pneumatic Superintendant	Air-Conditioning Superintendant	Landing Gear Superintendant	Electroplating Superintendant	Fuel Tank Superintendant	Engine Superintendant	Upholstery Superintendant	Weigh & Balance Superintendant
6	Cabin Interior Foreman	Hydraulic Foreman	Oxygen Foreman	Pneumatic 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	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	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	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	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	Air-Conditioning Mechanic	Landing Gear Mechanic	Electroplating Mechanic	Fuel Tank Mechanic	Engine Mechanic	Upholstery Tailor	Weigh & Balance Mechanic

Table 4.5 : Occupational Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector (Aviation Manufacturing)

Sector	Aviation Industry			
Sub Sector	Maintenance Repair Overhaul (MRO)			
Job Area	Aviation Manufacturing			
Sub Area/Level	Modification	Aviation Production		
	Aircraft Structure (Metal/Composite)	Aviation Design	Aviation Assembly	Aviation Machining
8	*No Level*	*No Level*	*No Level*	*No Level*
7	Aircraft Structure Superintendent	Designer Analysis Superintendent	Assembler Superintendent	Machinist Superintendent
6	Aircraft Structure Specialist*	Designer Analysis Specialist	Assembler Specialist	Machinist Specialist
5	Aircraft Structure Senior Engineer	Designer Analysis and Testing Engineer	Assembler Engineer	Machinist Engineer
4	Aircraft Structure Engineer*	Testing Designer	Assembler Tester	Machinist Supervisor
3	Aircraft Structure Supervisor	Drafter	Assembler Supervisor	Machinist Technician
2	Aircraft Structure Technician*	*No Level*	Assembler Operator	Machinist Operator
1	Aircraft Structure Mechanic*	*No Level*	Assembler	Machinist

*** Critical Job Titles**

Table 4.6 : Occupational Structure for the Aviation Industry – Airline Operation Sub sector

Sector	Aviation Industry					
Sub Sector	Airline Operation					
Job Area	Operation Despatch	Cabin Crew	Flight Crew			
Sub Area/Level			Wide Body	Narrow Body	General Aviation	
					Rotary	Fixed
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	*No Level*	*No Level*	Commander	Commander	Commander	Commander
6	*No Level*	*No Level*	Captain	Captain	Captain	Captain
5	Operation Despatch Manager	*No Level*	Senior First Officer	Senior First Officer	Senior First Officer	Senior First Officer
4	Operation Despatch Executive	In-flight Supervisor*	First Officer	First Officer	First Officer	First Officer
3	Operation Despatch Officer	Chief *	Second Officer	Second Officer	Second Officer	Second Officer
2	*No Level*	Cabin Crew*	*No Level*	*No Level*	*No Level*	*No Level*
1	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*

*** Critical Job Titles**

Table 4.7 : Occupational Area Structure for the Aviation Industry – Air Cargo Handling Sub sector

Sector	Aviation Industry
Sub Sector	Air Cargo Handling
Job Area	
Sub Area/Level	
8	*No Level*
7	*No Level*
6	*No Level*
5	Cargo Management
4	Cargo Administration
3	Air Cargo Operation
2	
1	*No Level*

Table 4.8: Occupational Area Structure for the Aviation Industry – Ground Handling Sub sector

Sector	Aviation Industry				
Sub Sector	Ground Handling				
Job Area / Sub Area/Level	In-flight Catering Support Services	Passenger Services	Ramp Services	Ground Support Equipment Services	
				Mechanical	Avionic
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
6	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
5	*No Level*	Passenger Services Management	Ramp Services Management	Aircraft Ground Support Equipment Management	Aircraft Ground Support Equipment Management
4	In-flight Catering Services Management	Passenger Services Administration	Ramp Services Administration	Aircraft Ground Support Equipment Administration	Aircraft Ground Support Equipment Administration
3	In-flight Catering Services Operation	Passenger Services Operation	Ramp Services Operation	Aircraft Ground Support Equipment Operation	Aircraft Ground Support Equipment Operation
2					
1	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*

Table 4.9: Occupational Area Structure for the Aviation Industry – Airport Operation & Management Sub sector

Sector	**Aviation Industry**		
Sub Sector	**Airport Operation & Management**		
Job Area / **Sub Area/Level**	**Landside Operation**	**Airside Operation**	**Terminal Operation**
8	*No Level*	*No Level*	*No Level*
7	*No Level*	*No Level*	*No Level*
6	*No Level*	*No Level*	*No Level*
5	Landside Management	Airside Management	Terminal Operation Management
4	Landside Administration	Airside Administration	Terminal Operation Administration
3	Landside Operation	Airside Operation	Terminal Operation
2			
1	*No Level*	*No Level*	*No Level*

Table 4.10 : Occupational Area Structure for the Aviation Industry sub sector – Maintenance Repair Overhaul (MRO) Sub-sector (Aviation Maintenance)

Sector	Aviation Industry							
Sub Sector	Maintenance Repair Overhaul (MRO)							
Job Area	Aviation Maintenance							
Sub Area/Level	Rotary Wing				Fixed Wing			
	Airframe	Piston Engine	Turbine Engine	Avionic	Airframe	Piston Engine	Turbine Engine	Avionic
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	Maintenance Engineering Management (Rotary Wing)				Maintenance Engineering Management (Fixed Wing)			
6	Maintenance Engineering Authorization (Rotary Wing)				Maintenance Engineering Authorization (Fixed Wing)			
5	Maintenance Engineering Operation (Rotary Wing)			Maintenance Engineering Operation - Avionic (Rotary Wing)	Maintenance Engineering Operation (Fixed Wing)			Maintenance Engineering Operation - Avionic (Fixed Wing)
4	Maintenance Technical Engineering Operation (Rotary Wing)			Maintenance Technical Engineering Operation - Avionic (Rotary Wing)	Maintenance Technical Engineering Operation (Fixed Wing)			Maintenance Technical Engineering Operation - Avionic (Fixed Wing)
3	Maintenance Operation Supervision (Rotary Wing)			Maintenance Operation Supervision - Avionic (Rotary Wing)	Maintenance Operation Supervision (Fixed Wing)			Maintenance Operation Supervision - Avionic (Fixed Wing)
2	Technical Maintenance Operation (Rotary Wing)			Technical Maintenance Operation - Avionic (Rotary Wing)	Technical Maintenance Operation (Fixed Wing)			Technical Maintenance Operation - Avionic (Fixed Wing)
1	Mechanical Maintenance Operation (Rotary Wing)			Mechanical Maintenance Operation - Avionic (Rotary Wing)	Mechanical Maintenance Operation (Fixed Wing)			Mechanical Maintenance Operation - Avionic (Fixed Wing)

Table 4.11 : Occupational Area Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector (Aircraft Engineering)

Sector	Aviation Industry							
Sub Sector	Maintenance Repair Overhaul (MRO)							
Job Area	Aircraft Engineering							
Sub Area/Level	Aircraft Structure Engineering							
	Sheet Metal Workshop	Galley Workshop	Flight Control Balancing	Composite Workshop	Non Destructive Testing (NDT)	Aviation Painting	Aviation Welding	Technical Services
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	Aircraft Fabrication Engineering Management				Aircraft NDT Management	Aircraft Painting Management	Aircraft Welding Management	Technical Services Management
6	Aircraft Fabrication Authorization			Aircraft Composite Authorization	Aircraft NDT Authorization	Aircraft Painting Authorization	Aircraft Welding Authorization	Technical Services Authorization
5	Aircraft Fabrication Specialised Engineering		Flight Control Balancing Specialised Engineering	Aircraft Composite Specialised Engineering	Aircraft NDT Specialised Engineering	Aircraft Painting Specialised Engineering	Aircraft Welding Specialisation Engineering	Technical Services Specialised Engineering
4	Aircraft Fabrication Engineering		Flight Control Balancing Engineering	Aircraft Composite Engineering	Aircraft NDT Engineering	Aircraft Painting Engineering	Aircraft Welding Engineering	Technical Services Engineering
3	Aircraft Fabrication Operation Supervision		Flight Control Balancing Operation Supervision	Aircraft Composite Operation Supervision	Aircraft NDT Operation Supervision	Aircraft Painting Operation Supervision	Aircraft Welding Operation Supervision	Technical Services Operation
2	Aircraft Fabrication Technical Operation		Flight Control Balancing Technical Operation	Aircraft Technical Composite Technical Operation	Aircraft NDT Technical Operation	Aircraft Painting Technical Operation	Aircraft Welding Technical Operation	*No Level*
1	Aircraft Fabrication Mechanical Operation		Flight Control Balancing Mechanical Operation	Aircraft Mechanical Composite Operation	Aircraft NDT Mechanical Operation	Aircraft Painting Mechanical Operation	Aircraft Welding Mechanical Operation	*No Level*

Table 4.11 : Occupational Area Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector (Aircraft Engineering)

Sector	Aviation Industry						
Sub Sector	Maintenance Repair Overhaul (MRO)						
Job Area	Aircraft Engineering						
Sub Area/Level	Avionic						
	Electrical	Electronic	Instrument	Auto Pilot	Navigation	Radar	Radio
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	Aircraft Electrical Management	Avionic Management				Radar Management	Radio Management
6	Aircraft Electrical Authorization	Avionic Authorization				Radar Authorization	Radio Authorization
5	Aircraft Electrical Specialised Engineering	Avionic Specialised Engineering				Radar Specialised Engineering	Radio Specialised Engineering
4	Aircraft Electrical Engineering	Avionic Engineering				Radar Engineering	Radio Engineering
3	Aircraft Electrical Operation Supervision	Avionic Operation Supervision				Radar Operation Supervision	Radio Operation Supervision
2	Aircraft Electrical Technical Operation	Avionic Technical Operation				Radar Technical Operation	Radio Technical Operation
1	Aircraft Electrical Mechanical Operation	Avionic Mechanical Operation				Radar Mechanical Operation	Radio Mechanical Operation

Table 4.11 : Occupational Area Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector (Aircraft Engineering)

Sector	**Aviation Industry**		
Sub Sector	**Maintenance Repair Overhaul (MRO)**		
Job Area	**Aircraft Engineering**		
Sub Area/Level	**Aviation Calibration**	**Flight Simulator Calibration**	**Manufacturing Design**
8	*No Level*	*No Level*	*No Level*
7	Calibration Testing Analysis Management	Flight Simulator Management	Manufacturing Design Management
6	Calibration Testing Analysis Authorization	Flight Simulator Designing Authorization	Manufacturing Designing Authorization
5	Calibration Testing Analysis Specialised Engineering	Flight Simulator Specialised	Manufacturing Designing Specialised
4	Calibration Testing Analysis Engineering	Flight Simulator Programming	Manufacturing Design Programming
3	Calibration Operation Supervision	Flight Simulator Operation Supervision	Manufacturing Design Operation Supervision
2	Calibration Technical Operation	Flight Simulator Operation	Manufacturing Design Operation
1	Calibration Mechanical Operation	*No Level*	*No Level*

Table 4.11 : Occupational Area Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector (Aircraft Engineering)

Sector	Aviation Industry										
Sub Sector	Maintenance Repair Overhaul (MRO)										
Job Area	Aircraft Engineering										
Sub Area/ Level	Mechanical										
	Cabin Interior	**Hydraulic**	**Oxygen**	**Pneumatic**	**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*
7	Cabin Interior Management	Hydraulic Management	Oxygen Management	Pneumatic Management	Air-Conditioning Management	Landing Gear Management	Electroplating Management	Fuel Tank Management	Engine Management	Upholstery Management	Weigh & Balance Management
6	Cabin Interior Authorization	Hydraulic Authorization	Oxygen Authorization	Pneumatic Authorization	Air-Conditioning Authorization	Landing Gear Authorization	Electroplating Authorization	Fuel Tank Authorization	Engine Authorization	Upholstery Authorization	Weigh & Balance Authorization
5	Cabin Interior Specialised Engineering	Hydraulic Specialised Engineering	Oxygen Specialised Engineering	Pneumatic Specialised Engineering	Air-Conditioning Specialised Engineering	Landing Gear Specialised Engineering	Electroplating Specialised Engineering	Fuel Tank Specialised Engineering	Engine Analysis and Testing Engineering	Upholstery Specialised Engineering	Weigh & Balance Specialised Engineering
4	Cabin Interior Engineering	Hydraulic Engineering	Oxygen Engineering	Pneumatic Engineering	Air-Conditioning Engineering	Landing Gear Engineering	Electroplating Engineering	Fuel Tank Engineering	Engine Overhaul Engineering	Upholstery Engineering	Weigh & Balance Engineering
3	Cabin Interior Operation Supervision	Hydraulic Operation Supervision	Oxygen Operation Supervision	Pneumatic Operation Supervision	Air-Conditioning Operation Supervision	Landing Gear Operation Supervision	Electroplating Operation Supervision	Fuel Tank Operation Supervision	Engine Operation Supervision	Upholstery Operation Supervision	Weigh & Balance Operation Supervision
2	Cabin Interior Technical Operation	Hydraulic Technical Operation	Oxygen Technical Operation	Pneumatic Technical Operation	Air-Conditioning Technical Operation	Landing Gear Technical Operation	Electroplating Technical Operation	Fuel Tank Technical Operation	Engine Technical Operation	Upholstery Technical Operation	Weigh & Balance Technical Operation
1	Cabin Interior Mechanical Operation	Hydraulic Mechanical Operation	Oxygen Mechanical Operation	Pneumatic Mechanical Operation		Landing Gear Mechanical Operation	Electroplating Mechanical Operation		Engine Mechanical Operation	Upholstery Mechanical Operation	

Table 4.12 : Occupational Area Structure for the Aviation Industry – Maintenance Repair Overhaul (MRO) Sub sector – (Aviation Manufacturing)

Sector	Aviation Industry			
Sub Sector	Maintenance Repair Overhaul (MRO)			
Job Area	Aviation Manufacturing			
Sub Area/Level	Modification	Aviation Production		
	Aircraft Structure (Metal/Composite)	Aviation Design	Aviation Assembly	Aviation Machining
8	*No Level*	*No Level*	*No Level*	*No Level*
7	Aircraft Structural Modification Management	Aviation Manufacturing Production Management		
6	Aircraft Structural Modification Authorization	Aviation Manufacturing Analysis Assembly		
5	Aircraft Structural Modification Specialised Engineering	Aviation Manufacturing Analysis Engineering		
4	Aircraft Structural Modification Engineering	Aviation Manufacturing Designing Engineering		
3	Aircraft Structural Modification Operation Supervision	Aviation Manufacturing Operation Supervision		
2	Aircraft Structural Modification Technical Operation	*No Level*	Aviation Manufacturing Technical Operation	
1	Aircraft Structural Modification Mechanical Operation	*No Level*	Aviation Manufacturing Mechanical Operation	

Table 4.13 : Occupational Area Structure for the Aviation Industry – Airline Operation Sub sector

Sector	Aviation Industry					
Sub Sector	Airline Operation					
Job Area	Operation Despatch	Cabin Crew	Flight Crew			
Sub Area/Level			Wide Body	Narrow Body	General Aviation	
					Rotary	Fixed
8	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*
7	*No Level*	*No Level*	Flight Deck Management	Flight Deck Management	Flight Deck Management	Flight Deck Management
6	*No Level*	*No Level*				
5	Operation Despatch Management	*No Level*	Flight Deck Management Support	Flight Deck Management Support	Flight Deck Management Support	Flight Deck Management Support
4	Operation Despatch Administration	In-flight Supervision				
3	Operation Despatch Operation	In-flight Operation				
2	*No Level*		*No Level*	*No Level*	*No Level*	*No Level*
1	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*	*No Level*

4.4 CRITICAL JOB TITLES - SKILLED PERSONNEL DEMAND IN THE AVIATION INDUSTRY

This section will highlight the critical job titles which reflect skilled personnel requirement in the Aviation industry. Job titles under this category reflect the immediate industry requirement for skilled workers. The identification of critical job titles is the essence of developing the Occupational Standard for the job so that formal training can be carried out and skilled workers can be produced and supplied to the industry. It must be highlighted that other job titles not considered as critical is because the current number of personnel under these categories is sufficient.

Critical job titles are defined based on the following scenarios in order of importance:

i. Shortages of skilled workers supply in the industry
ii. Shortages of workers for a particular job area in the industry
iii. Strategic assessment in terms of direction for both short term and long term periods

However, it must be highlighted that **not all of the listed job titles** can be developed in the form of the NOSS (National Occupational Skills Standards) due to regulations and authority body requirements. These job titles are such as Aviation Security and Licensed Aircraft Engineer. However, consideration should be given in accommodating the possibility of developing the NOSS for these job areas but ensuring they are in line with the requirements of authority bodies by collaborating and mapping common areas with the relevant agencies.

Table 4.14: List of Critical Job Titles

Item	Critical Job Title	Short Term (1-3 years) (√)	Medium Term (4-5 years) (√)
Sub Sector: Air Cargo Handling			
1	Air Cargo Handling Personnel Level 2	√	
Sub Sector: Ground Handling			
2	In-flight Catering Support Services Personnel Level 2	√	
3	In-flight Catering Support Services Supervisor Level 3	√	
4	Passenger Services Personnel Level 2	√	
5	Passenger Services Supervisor / Officer Level 3	√	
6	Ramp Services Personnel Level 2	√	
7	Ramp Services Supervisor/ Officer Level 3	√	
Sub Sector: Airport Operation and Management			
8	Landside Personnel Level 2	√	
9	Airside Personnel Level 2	√	
10	Terminal Operation Personnel Level 2	√	
11	Terminal Operation Supervisor/Officer Level 3	√	
Sub Sector: Maintenance, Repair and Overhaul (MRO)			
12	Piston Engine Mechanic (Rotary Wing) Level 1	√	
13	Piston Engine Technician (Rotary Wing) Level 2	√	
14	Piston Engine Licensed Aircraft Engineer (LAE) (Without Rating) (Rotary Wing) Level 4	√	
15	Piston Engine Licensed Aircraft Engineer (LAE) (Type Rating) (Rotary Wing) Level 5	√	
16	Turbine Engine Technician (Rotary Wing) Level 2	√	

17	Turbine Engine Licensed Aircraft Engineer (LAE) (Without Rating) (Rotary Wing) Level 4	√	
18	Turbine Engine Licensed Aircraft Engineer (LAE) (Type Rating) (Rotary Wing) Level 5	√	
19	Piston Engine Mechanic (Fixed Wing) Level 1	√	
20	Piston Engine Technician (Fixed Wing) Level 2	√	
21	Piston Engine Licensed Aircraft Engineer (LAE) (Without Rating) (Fixed Wing) Level 4	√	
22	Piston Engine Licensed Aircraft Engineer (LAE) (Type Rating) (Fixed Wing) Level 5	√	
23	Turbine Engine Technician (Fixed Wing) Level 2	√	
24	Turbine Engine Licensed Aircraft Engineer (LAE) (Without Rating) (Fixed Wing) Level 4	√	
25	Turbine Engine Licensed Aircraft Engineer (LAE) (Type Rating) (Fixed Wing) Level 5	√	
26	Sheet Metal Supervisor Level 3	√	
27	Sheet Metal Technician Level 2	√	
28	Sheet Metal Mechanic Level 1	√	
29	Galley Supervisor Level 3	√	
30	Aircraft Structure Mechanic Level 1	√	
31	Aircraft Structure Technician Level 2	√	
32	Aircraft Structure Engineer Level 4	√	
33	Aircraft Structural Specialist Level 6	√	
Sub Sector: Airline Operation			
34	Cabin Crew Level 2	√	
35	Chief Level 3	√	
36	In-flight Supervisor Level 4	√	

Table 4.14 shows that there are 36 critical job titles that are required in the short term. Most of the critical job titles are under the MRO sub-sector, followed by job titles under the Ground Handling Sub-sector. With this information, it can be viewed that either relevant NOSSes be developed accordingly, or in the event that the job title requires licensing, the NOSS may be developed in accordance to the licensing requirements or might not be developed as a NOSS. However, personnel for these critical job titles can still be trained via authorised organisations other than skills training.

Table 4.15: Summary of Job Titles

SECTOR	SUB-SECTOR	LEVEL									Total Critical Job Titles	Total Job Titles
		NCS	1	2	3	4	5	6	7	8		
Aviation Industry Job Titles	Air Cargo Handling	0	0	1	1	1	1	0	0	0	**1**	**4**
	Ground Handling	0	0	5	5	5	4	0	0	0	**6**	**19**
	Airports Operation & Management	0	0	3	3	3	3	0	0	0	**4**	**12**
	Maintenance Repair Overhaul (MRO)	0	37	39	41	41	41	41	41	0	**22**	**281**
	Airline Operation	0	0	1	6	6	5	4	4	0	**3**	**26**
TOTAL CRITICAL JOB TITLES		0	4	14	7	6	4	1	0	0	**36**	
TOTAL JOB TITLES		0	37	49	56	56	54	45	45	0		**342**

Table 4.15 shows the summary of job titles according to sub-sectors, areas and sub-areas. It can be seen that the majority of the critical job titles were mainly from the MRO Sub Sector with 22 job titles.

4.5 CURRENT SUPPLY AND DEMAND ANALYSIS (2011 – 2013)

In order to further confirm the findings obtained through qualitative techniques to identify the job titles and job areas currently in demand in the Aviation Industry, a supply and demand analysis has been conducted which is based on quantitative techniques.

The data used for the supply and demand analysis comes from two primary sources. Supply-side data comes from the Department of Skills Development for Malaysian Skills Certification data and the departments under the Ministry of Higher Education. This data includes completers of all educational or training programs. Demand-side data comes from the Department of Statistics Malaysia which is mapped to the Malaysian Standard Industry Classification codes (MSIC 2008). The MSIC is based on standard occupational categories to quantify labor in the respective industry sectors. These two sources are statistically reliable quantitative sources of supply and demand information available. However, the standard occupational groups are broader than the job titles as highlighted in the Occupational Structures defined in this analysis for the Aviation Industry and this is taken into account in the interpretation of the findings.

Current demand data shows the data of workers entering the industry with relevant qualifications. These workers are analysed based on the criteria of education levels to provide an indicator of the quality of labour for this industry. Quality of labour is an important factor in driving productivity growth. Quality of labour is measured as a percentage of employment of those with tertiary level education. Based on Malaysian Productivity Report 2012/2013, in terms of the education level of the labour force, only 25.6% of the total employed possessed tertiary level education as compared with South Korea, Japan, USA, Canada and Australia where more than 40% of

the labour force possessed tertiary level education. However, the labour market was seen to improve, reflected by an increase in labour force participation rising from 62.6% in 2008 to 65.6% in 2012. This healthy trend was supported by an encouraging decrease of unemployment trend, which fell from 3.3% in 2008 to 3.0% in 2012. At the same time, employment recorded an increase (from 10.7 million employees in 2008 to and 12.7 million in 2012). [24]

The findings and statistics obtained and analysed are presented in the graphs in the next section.

4.5.1 Current Supply (2011 – 2013)

The current supply of graduates between the years 2011 till 2013 with qualifications in the fields relevant to the Aviation Industry is depicted in the graphs below. The qualifications observed in this study are from the certificate to degree level. The overall aggregate of qualifications is analysed for these three qualification levels.

The supply data is in the form of the various courses and education programmes related to the relevant sub sectors in the Aviation Industry Occupational Structure. Based on recent discussions with panel members, training in the aviation industry also consists of Approved Training Organisations as accredited by the Department of Civil Aviation Malaysia. These Approved Training Organisations adhere to safety standards set by international regulatory bodies. Another point is that most training is conducted by the airlines and airport operation management in order to be in line with the

[24] Malaysian Productivity Report 2012/2013. Malaysian Productivity Corporation. http://www.mpc.gov.my/publication/APR2013.pdf

organisation requirements, SOP and most importantly safety regulations.

4.5.1.1 Aviation Industry Supply by Aggregate of Qualifications

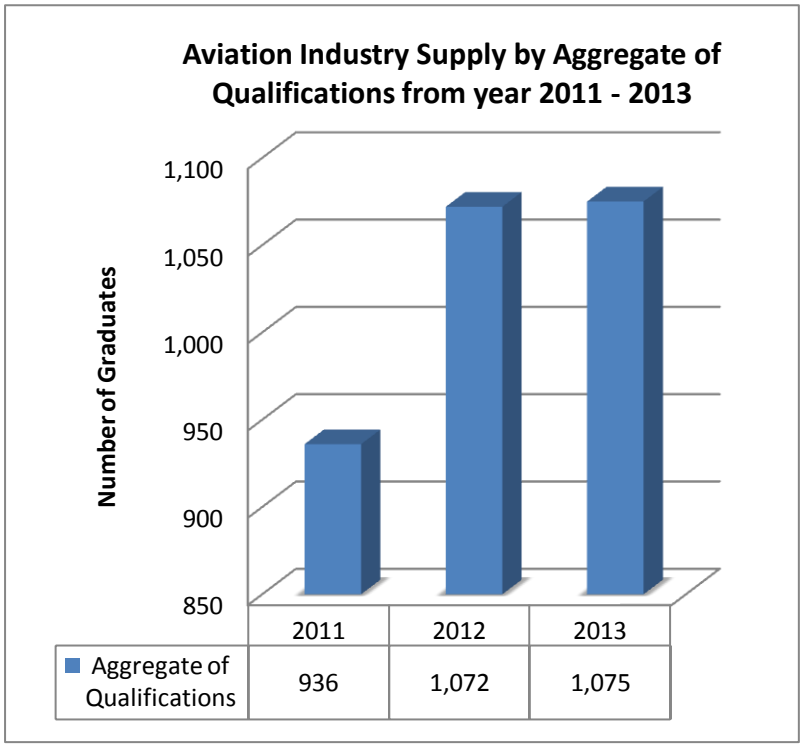
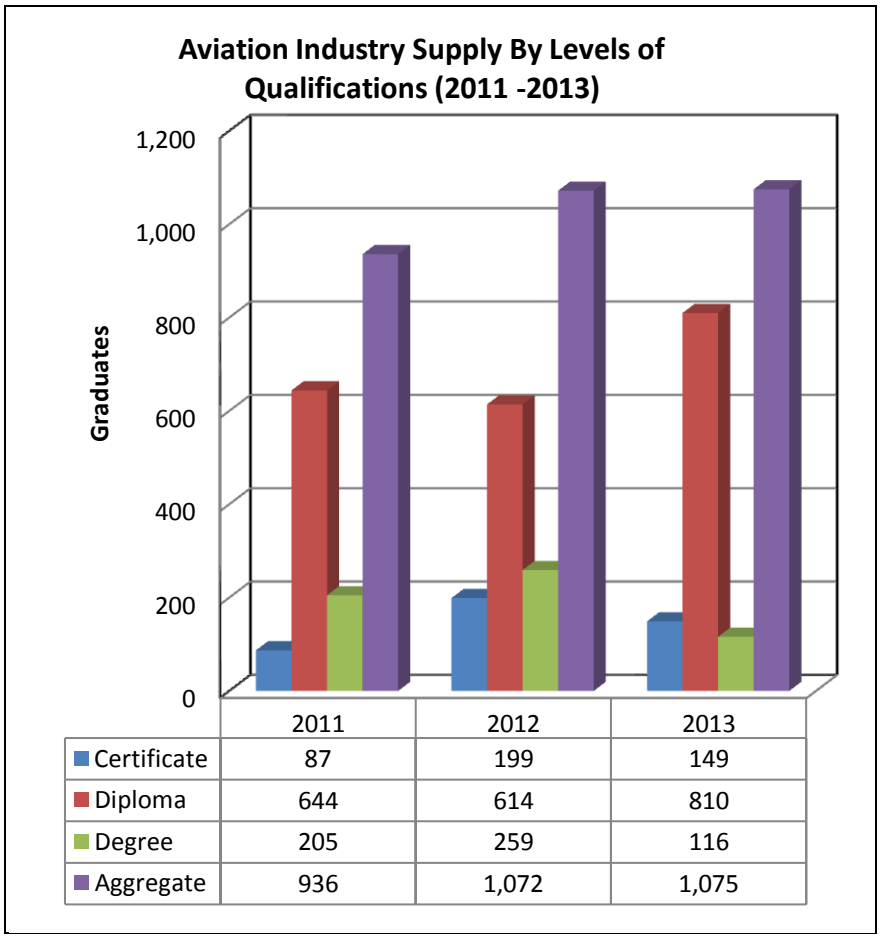


Figure 4.2 : Supply by Aggregate of Qualifications

The above graph shows that the aggregate of qualifications in the year 2013, with 1,075 graduates as the highest among the 3 years observed. There has been a steady increase of graduates since year 2011 till 2013. With the aspirations of becoming a high income nation, the requirements of higher level qualifications is imperative. Therefore, from the graph above we can see that this is a steady increase of graduates qualified at either the certificate, diploma or degree level. The following section breaks down the data above according to the different levels of qualifications.

4.5.1.2 Aviation Industry Supply by Levels of Qualifications

The following graph shows the number of graduates in courses relevant to aviation. It can be seen that most graduates are at diploma level and those with certificates are very minimal. This is apparent as in the year 2012, in line with the Economic Transformation Programme (ETP) and various Entry Point Projects (EPP) geared towards a high income nation, many education institutions stepped up in terms of program delivery and graduate output to accommodate for increased demand for qualified and skilled workforce.



	2011	2012	2013
Certificate	87	199	149
Diploma	644	614	810
Degree	205	259	116
Aggregate	936	1,072	1,075

Figure 4.3: Supply by Levels of Qualifications

The majority of graduate output throughout the 3 years stated above, were diploma holders, where in the year 2013 there were as many as 810 graduates. There has also been a decrease of 50 certificate holders from year 2012 to 2013. Degree holders have also faced a decrease from 259 in year 2012 to 116 in the year 2013. The reason being is that currently there is an increase of higher learning institutions offering aviation related programmes at Diploma level and that most completers in the aforesaid years were at diploma level. It can be seen that the majority of the graduates possess diplomas relevant to the Aviation Industry. Factors leading to this are because education and training at diploma levels are more accessible compared to degree level programmes. Furthermore, diploma programmes related to the industry can be found in most education institutes such as in Approved Training Organisations, skills training centres and Universities.

However, there was still a satisfactory enrollment for degree level programmes in years 2010 and 2011 where the output was not until the years after 2013 and thus could not be captured in the analysis above.

4.5.2 Current Demand (2011 – 2013)

Current demand data shows the data of workers entering the industry with relevant qualifications. Current demand in the industry is calculated by finding the diffrence between the workers in the current year and previous year. Calculations resulting in positives show an increase of workers in the industry, where

negative results show a decrease of workers either caused by termination or migration to other industries.

4.5.2.1 Aviation Industry Demand by Aggregate of Qualifications

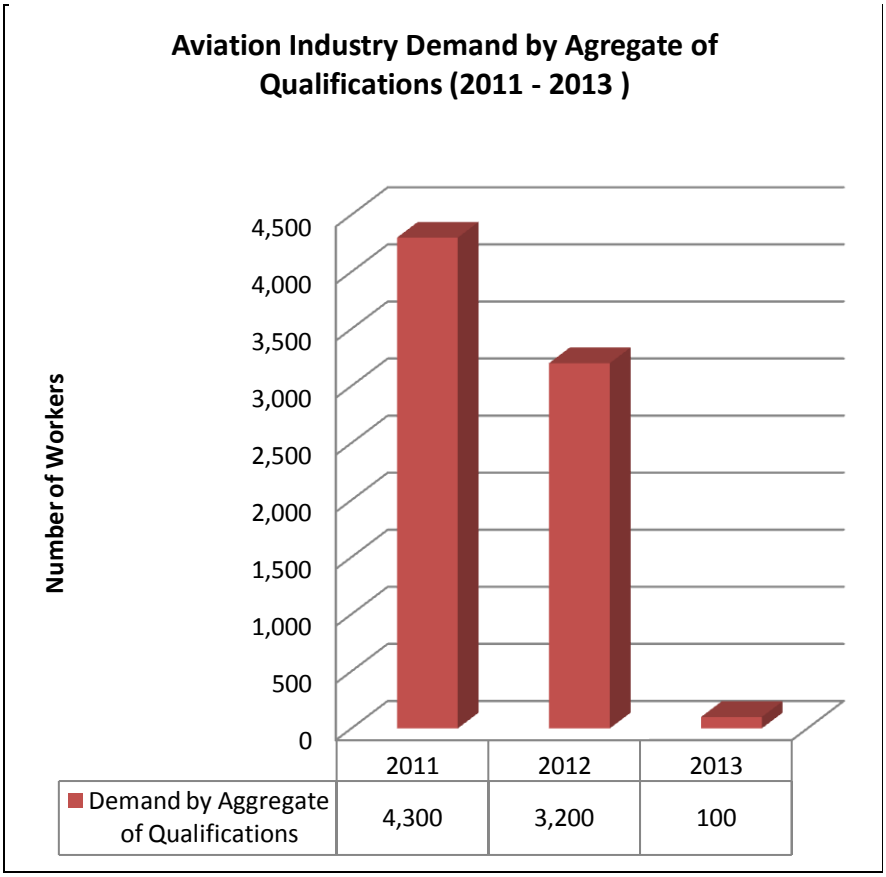
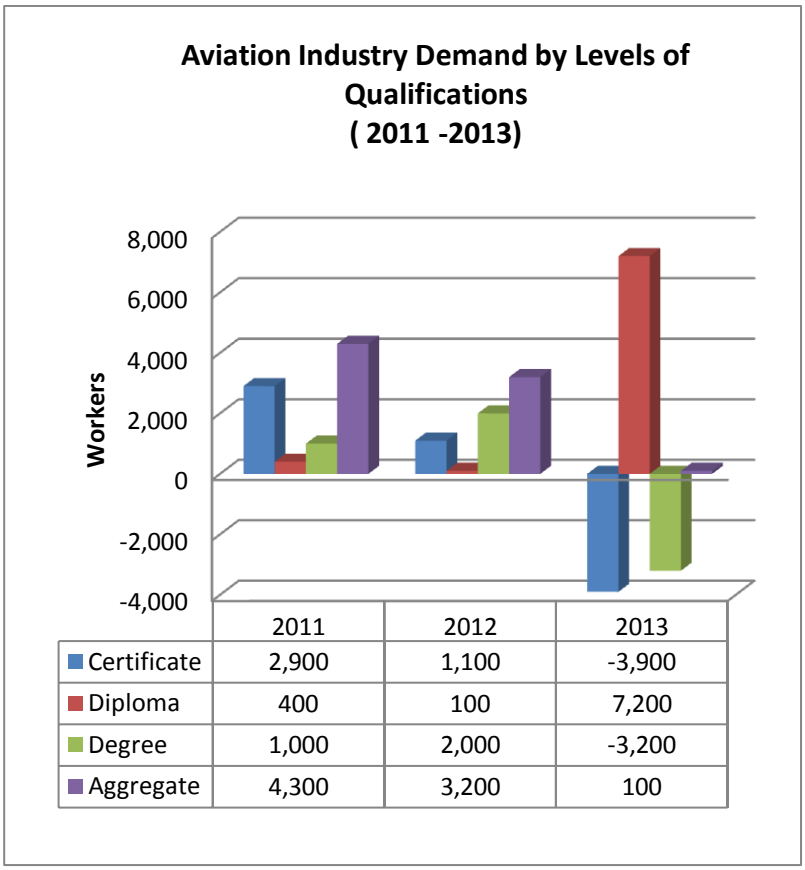


Figure 4.4: Demand by Aggregate of Qualifications

The graph above shows that the year 2011 saw the most number of workers qualified at the certificate, diploma and degree level which was 4,300 workers. However, the demand decreased in the year 2012, from 3,200 workers to only a demand of 100 workers in the year 2013. This decrease is caused by two most likely scenarios, either by migration of the workers to other industries or the termination of workers by employers. Further breakdown of the types of qualifications by year can be seen in the following section.

4.5.2.2 Aviation Industry Demand by Levels of Qualifications



	2011	2012	2013
Certificate	2,900	1,100	-3,900
Diploma	400	100	7,200
Degree	1,000	2,000	-3,200
Aggregate	4,300	3,200	100

Figure 4.5: Demand by Levels of Qualifications

The graph above shows that the most number of workers with qualifications, were the 7,200 workers with diplomas in the year 2013. However, there was a negative demand for that same year 2013 for certificate and degree holders, with demand of –3,900 workers with certificates and -3,200 workers with degrees. The reason for this decrease may have been due to either migration to other industries, termination or due to the high influx of certificate and degree holders entering the industry in the year 2012, thus demanding lesser workers with the latter qualifications in the year 2013.

4.5.2.3 Mapping of Occupational Structure to Demand Data

The classifications of the industry groups as stated in the Malaysian Standards Industry Classification (MSIC 2008) have been mapped to the Aviation Industry Occupational Structure's job areas as seen below. Through this mapping, we can see the direct relation of the analysed MSIC data to the Occupational Structure and how it relates to the demand analysis.

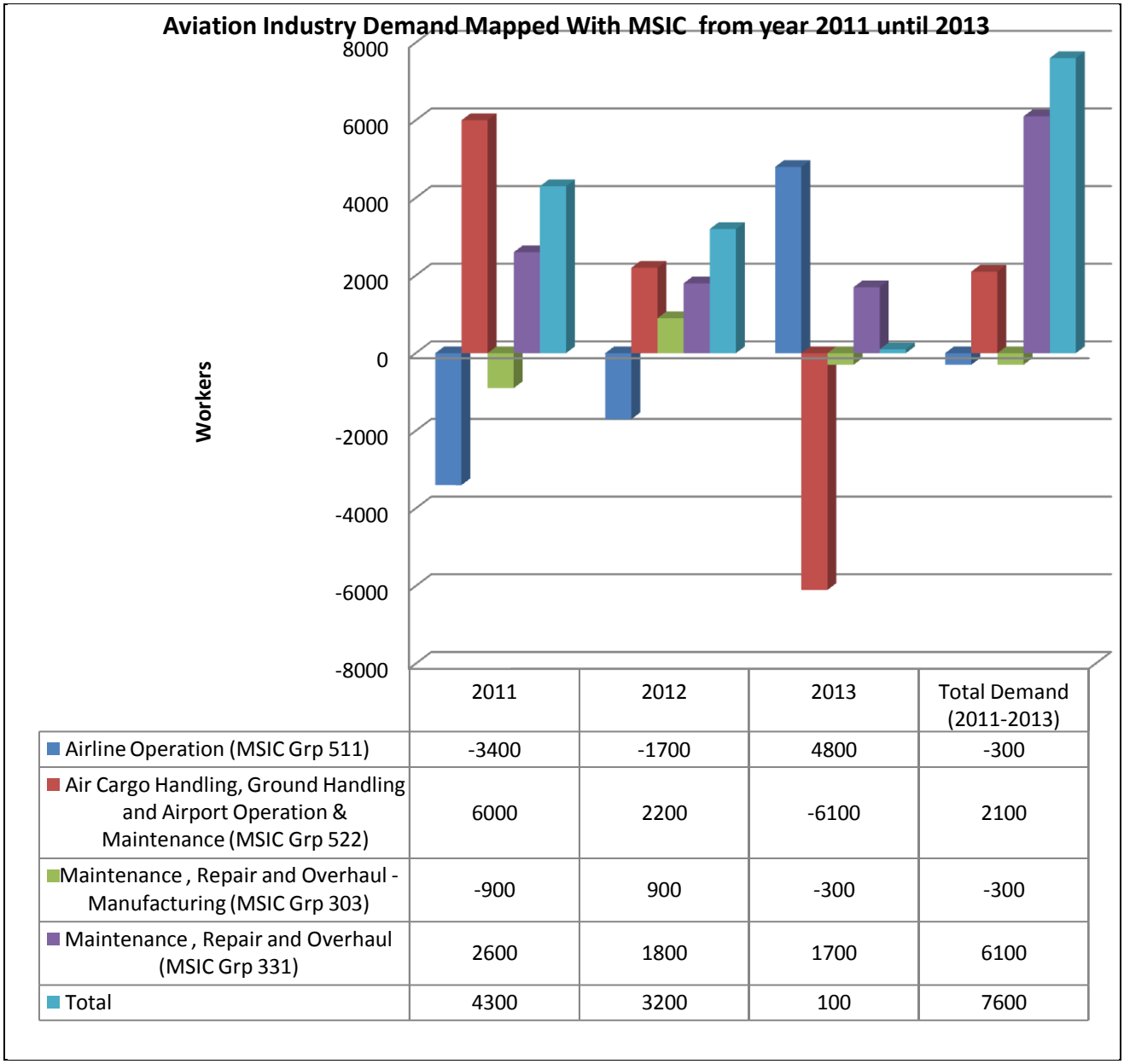
Table 4.16 shows the mapping done between the occupational structure developed with panel members and the occupational classifications as defined in the Malaysian Standard Industry Classification (MSIC). Through this mapping the statistical data obtained from the Department of Statistics is able to be referred according to the first three digits of the respective occupational classifications.

Table 4.16: Mapping of MSIC to Aviation Industry OS

Malaysian Standard Industry Classification (MSIC) Groups	Air Cargo Handling	Ground Handling	Airport Operation and Management	Maintenance Repair Overhaul (MRO)	Airline Operation
511 Passenger Air Transport					√
522 Support activities for transportation (Item includes the operation of airway terminal)			√		
52231 Operation of terminal facilities			√		
52233 Ground service activities on airfields		√			
5224 Cargo Handling	√				
303 Manufacture of air and spacecraft and related machinery				√	
331 Repair of fabricated metal products, machinery and equipment (Item 2(a) includes repair and maintenance of aircraft engine instruments)				√	

.6 that for the 3 years analysed, the accumulated demand for MRO was the highest at 6,100 workers. There has also not yet been a

negative demand for workers in the MRO Subsector (MSIC Group 331). The second highest number of demand are workers in the Air Cargo Handling, Ground Handling and Airport Operation & Management area with 2,100 workers from year 2011 till 2013.



	2011	2012	2013	Total Demand (2011-2013)
Airline Operation (MSIC Grp 511)	-3400	-1700	4800	-300
Air Cargo Handling, Ground Handling and Airport Operation & Maintenance (MSIC Grp 522)	6000	2200	-6100	2100
Maintenance , Repair and Overhaul - Manufacturing (MSIC Grp 303)	-900	900	-300	-300
Maintenance , Repair and Overhaul (MSIC Grp 331)	2600	1800	1700	6100
Total	4300	3200	100	7600

Figure 4.6: Demand by Aviation Industry Job Areas Mapped to MSIC (2011 – 2013)

4.5.3 Supply and Demand Gap Analysis

The supply and demand gap analysis is important in developing workforce planning strategies. There are two types of gaps: Undersupply and Oversupply. Undersupply occurs when workforce supply falls short of demand (that is, there is an insufficient amount of skills). When workforce surplus exceeds demand, there is an oversupply or workforce surplus.

4.5.2.4 Supply and Demand Gap Analysis by Aggregate of Qualifications

Supply and demand gap analysis is calculated by subtracting the demand data from the supply data for a specific year in order to estimate the oversupply or undersupply of individuals.

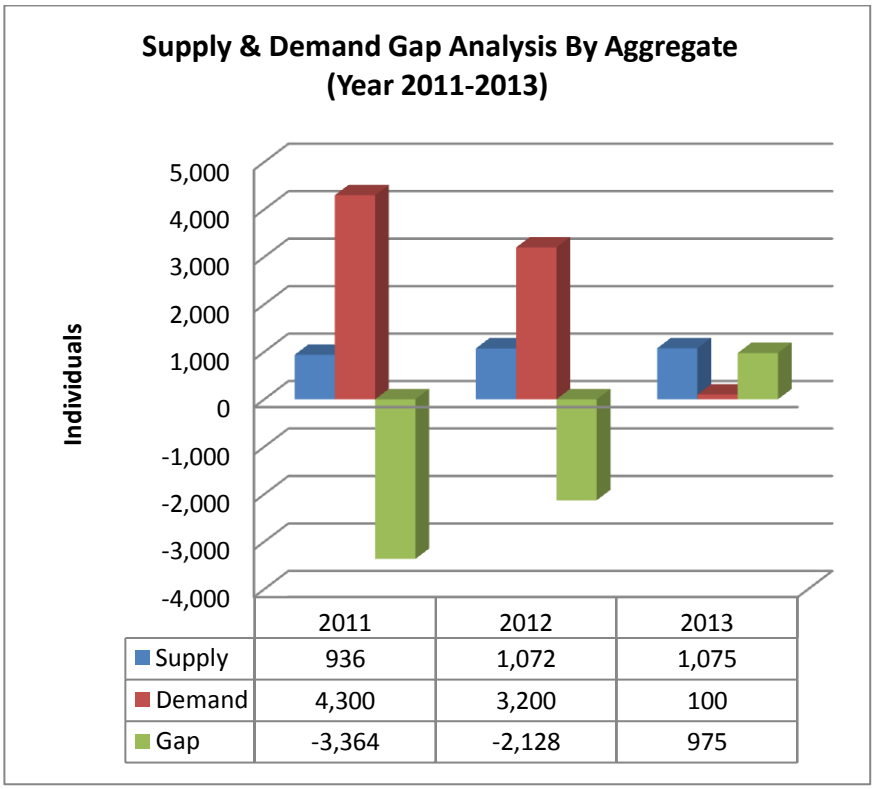
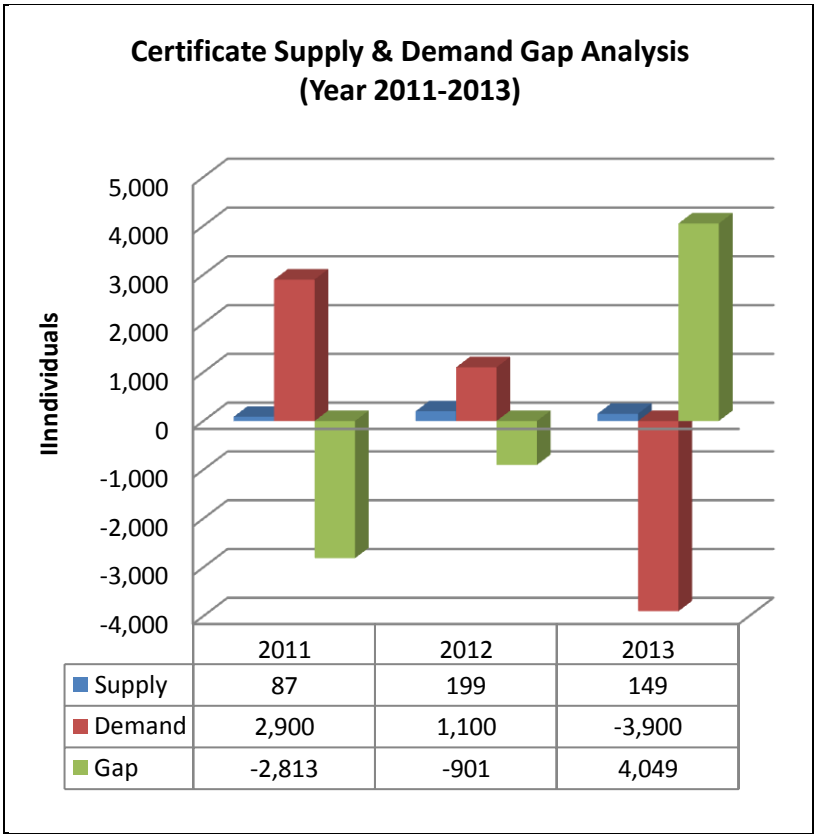


Figure 4.7 : Supply and Demand Gap Analysis by Aggregate (2011 -2013)

The supply and demand gap analysis is shown as above. The biggest gap is in the year 2011 with an undersupply of -3,364 persons. This gap decreases to -2,128 in year 2012, and in the year 2013 there is an oversupply of 975.

4.5.2.5 Supply and Demand Gap Analysis by Levels of Qualifications

Supply and Demand analysis was done on the three levels of qualifications, which were at certificate level, diploma level and degree level. This analysis is conducted in order to observe the gap obtained by calculating the difference between the supply of qualified graduates and demand for the qualified individuals.

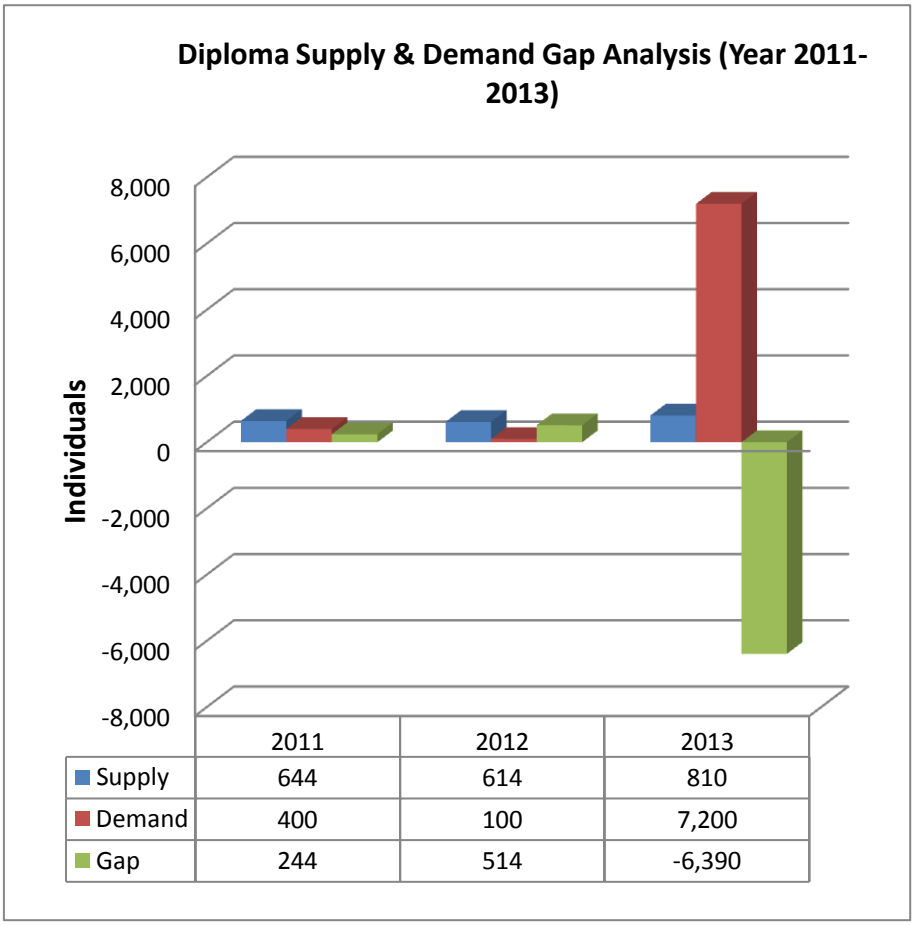


	2011	2012	2013
Supply	87	199	149
Demand	2,900	1,100	-3,900
Gap	-2,813	-901	4,049

Figure 4.8: Certificate Supply and Demand Gap Analysis (2011 -2013)

The graph above shows that there was an undersupply of -2,813 certificate qualified workers in the year 2011, which increased to -901

persons in the year 2012. The year 2013 saw an oversupply of 4049 persons, mainly due to the -3,900 demand of certificate level workers in 2013.



	2011	2012	2013
Supply	644	614	810
Demand	400	100	7,200
Gap	244	514	-6,390

Figure 4.9: Diploma Supply and Demand Gap Analysis (2011 -2013)

The graph above shows the supply and gap analysis for diploma level qualifications, it can be that there was an oversupply of 244 diploma qualified workers for the year 2011, which increased to an oversupply of 514 diploma qualified persons in the year 2012. The year 2013 saw a sharp decrease which was -6390. This may have been due to the high increase of demand for diploma qualified workers.

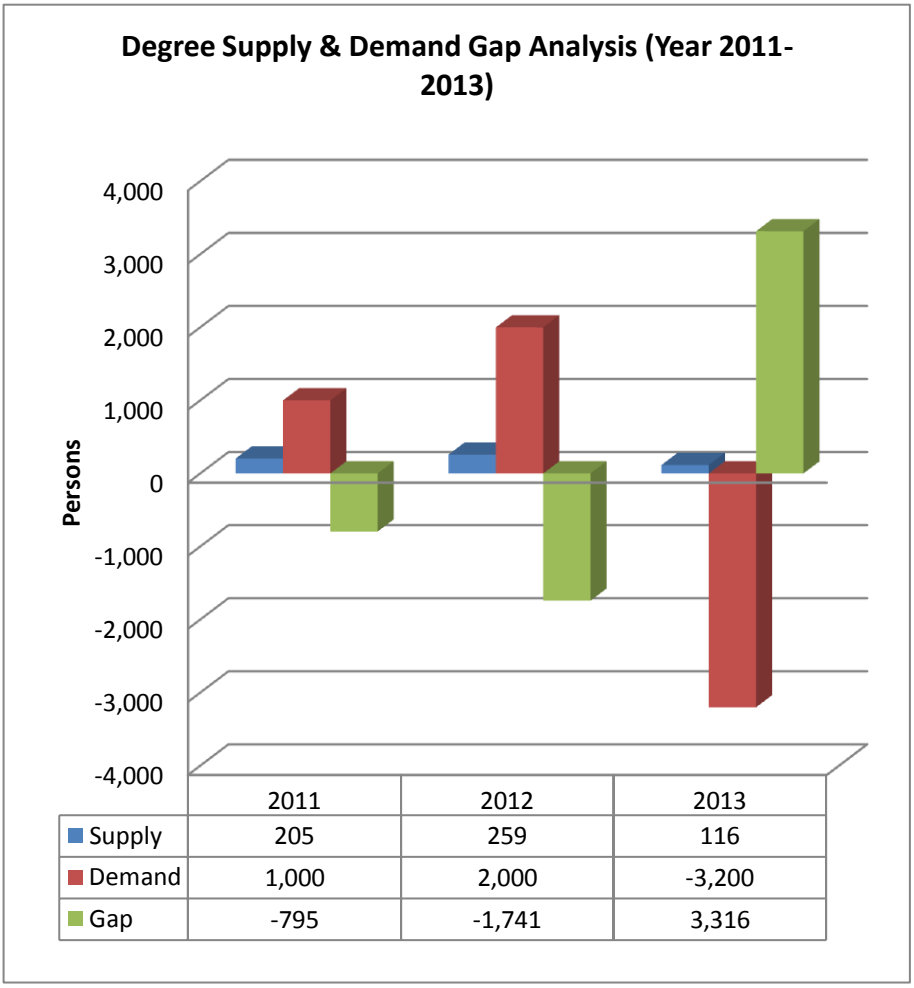


Figure 4.10: Degree Supply and Demand Gap Analysis (2011 -2013)

The graph above shows that there was an undersupply of -795 degree qualified workers for the year 2011, which decreased to -1,741 in the year 2012. The year 2013 saw a decrease in demand thus leading to an oversupply of 3316 degree qualified workers.

4.6 PROJECTED SUPPLY AND DEMAND ANALYSIS (2011 – 2020)

The graphs below show the projected supply, demand and supply and demand gap from the year 2011 until 2020. By applying extrapolation of historical data, the following graphs show the possible projection of the workforce in terms of qualifications and aggregate of qualifications.

However it must be noted that linear regression is applied therefore the results generated are linear where in reality may be influenced by current economic situations at that point of time.

4.6.1 Projected Supply by Aggregate of Qualifications (2011-2020)

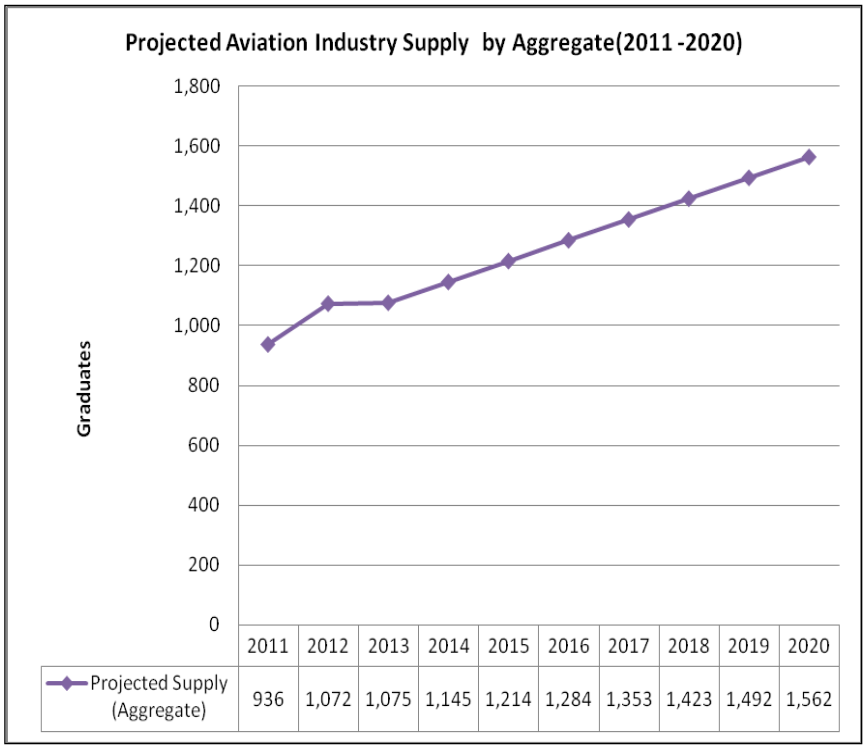
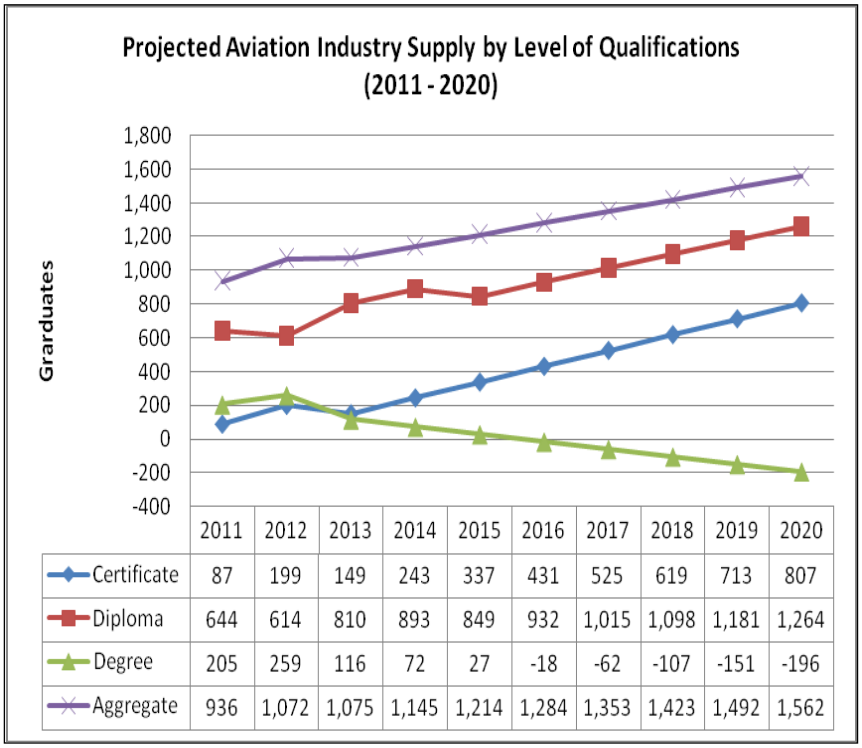


Figure 4.11: Projected Supply by Aggregate (2011 -2020)

The chart above shows a steady increase of qualified graduates until the year 2020 at 1,562 graduates. This is a good indicator that future workers in the workforce will be qualified and skillful.

4.6.2 Projected Supply by Levels of Qualifications (2011-2020)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Certificate	87	199	149	243	337	431	525	619	713	807
Diploma	644	614	810	893	849	932	1,015	1,098	1,181	1,264
Degree	205	259	116	72	27	-18	-62	-107	-151	-196
Aggregate	936	1,072	1,075	1,145	1,214	1,284	1,353	1,423	1,492	1,562

Figure 4.12: Projected Supply by Qualifications (2011 -2020)

The graph above shows that the projected supply of degree holders will steadily decrease until -196 graduates in the year 2020. Therefore there must be a strategy to avoid this issue. However, for certificate and diploma holders the projection is more positive by the year 2020 with diploma holders as many as 1,264 graduates and 807 certificate holders.

4.6.3 Projected Demand by Aggregate of Qualifications (2011-2020)

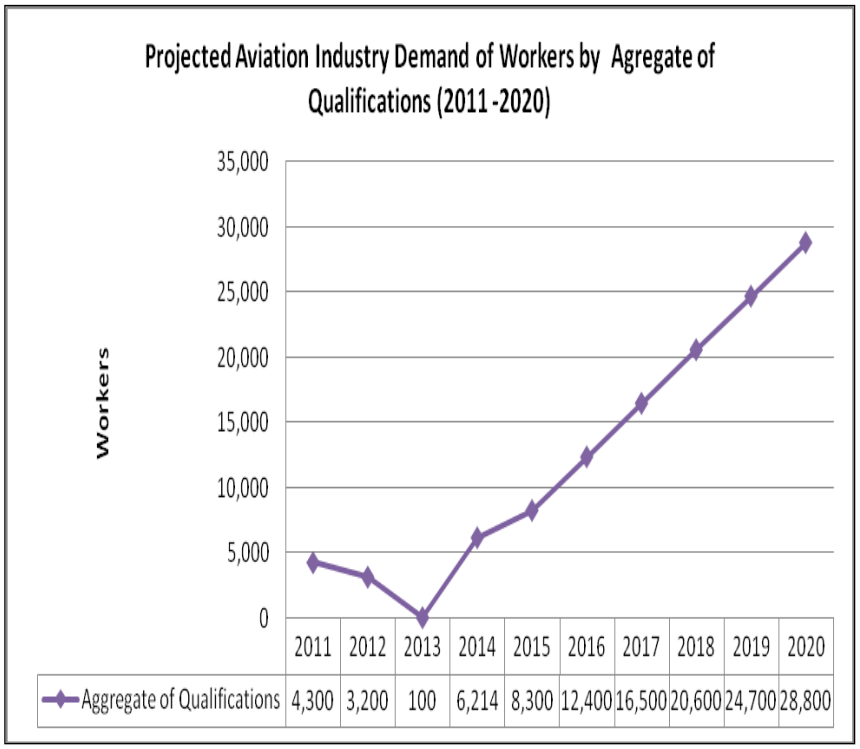
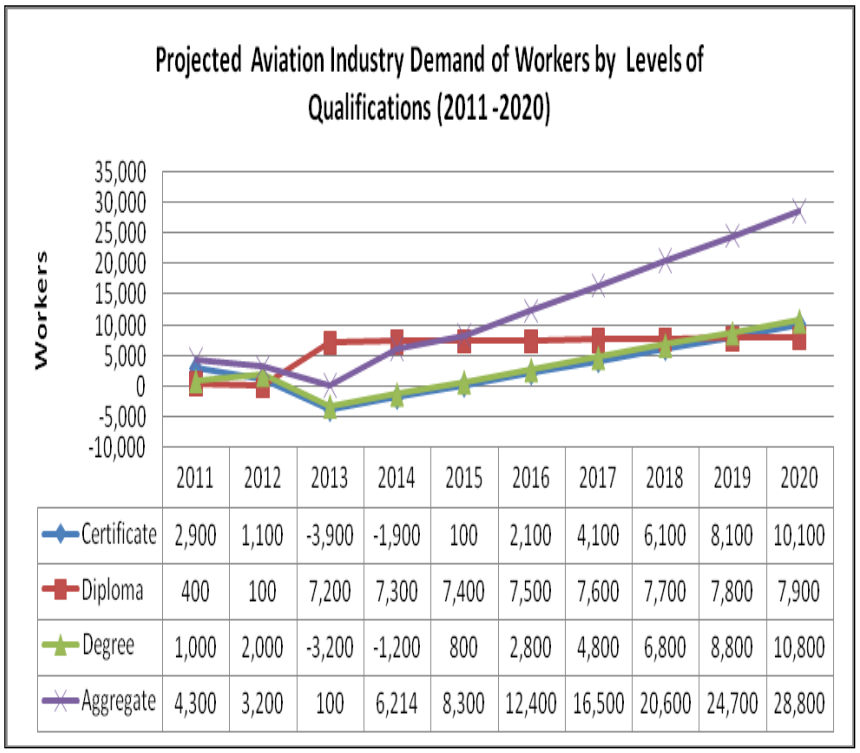


Figure 4.13 : Projected Demand by Aggregate (2011 -2020)

The figure above shows the increasing trend of demand for qualified workers entering the Aviation Industry from 2014 until 2020, with as many as 28800 qualified workers. This projection is in line with the EPP 1: Growing Aviation Maintenance, Repair and Overhaul Services under the Business Services ETP, that had projected 20,740 jobs by the year 2020. It must reminded that the number 28,800 is the demand and not the number of workers, therefore the number of workers may be much larger than this value.

This is based on the target of developing Malaysia into a regional aviation maintenance, repair and overhaul (MRO) services hub, capitalising on global market growth that is projected to reach RM205 billion by 2020.[25]

4.6.4 Projected Demand by Levels of Qualifications (2011-2020)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Certificate	2,900	1,100	-3,900	-1,900	100	2,100	4,100	6,100	8,100	10,100
Diploma	400	100	7,200	7,300	7,400	7,500	7,600	7,700	7,800	7,900
Degree	1,000	2,000	-3,200	-1,200	800	2,800	4,800	6,800	8,800	10,800
Aggregate	4,300	3,200	100	6,214	8,300	12,400	16,500	20,600	24,700	28,800

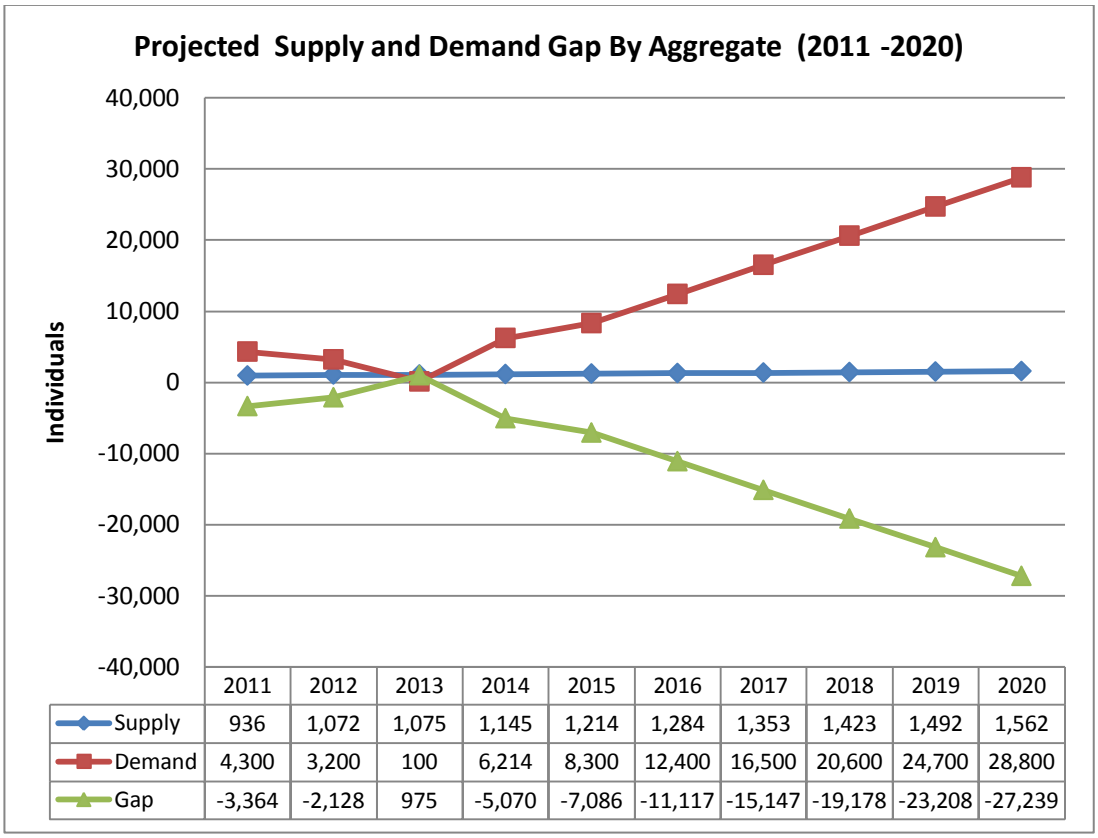
Figure 4.14: Projected Demand by Levels of Qualifications (2011 -2020)

Figure 4.14 shows that the trend of workers entering the industry with certificate, diploma and degree level qualifications will continue until the year 2020. Therefore it is projected that there will be 10,100 certificate holders, 7,900 diploma holders and 10,800

[25] EPP 1: Growing Aviation Maintenance, Repair and Overhaul Services http://etp.pemandu.gov.my/Business_Services-@-Business_Services_-_EPP_1-;_Growing_Aviation_Maintenance,_Repair_and_Overhaul_Services.aspx#sthash.KjCwGkzk.dpuf

degree holders. This can be seen as a positive, meaning that the level of education required is enhanced. The increased demand of workers with tertiary education by the year 2020 supports the notion that higher qualifications will be more in demand.

4.6.5 Projected Supply and Demand by Aggregate of Qualifications (2011-2020)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Supply	936	1,072	1,075	1,145	1,214	1,284	1,353	1,423	1,492	1,562
Demand	4,300	3,200	100	6,214	8,300	12,400	16,500	20,600	24,700	28,800
Gap	-3,364	-2,128	975	-5,070	-7,086	-11,117	-15,147	-19,178	-23,208	-27,239

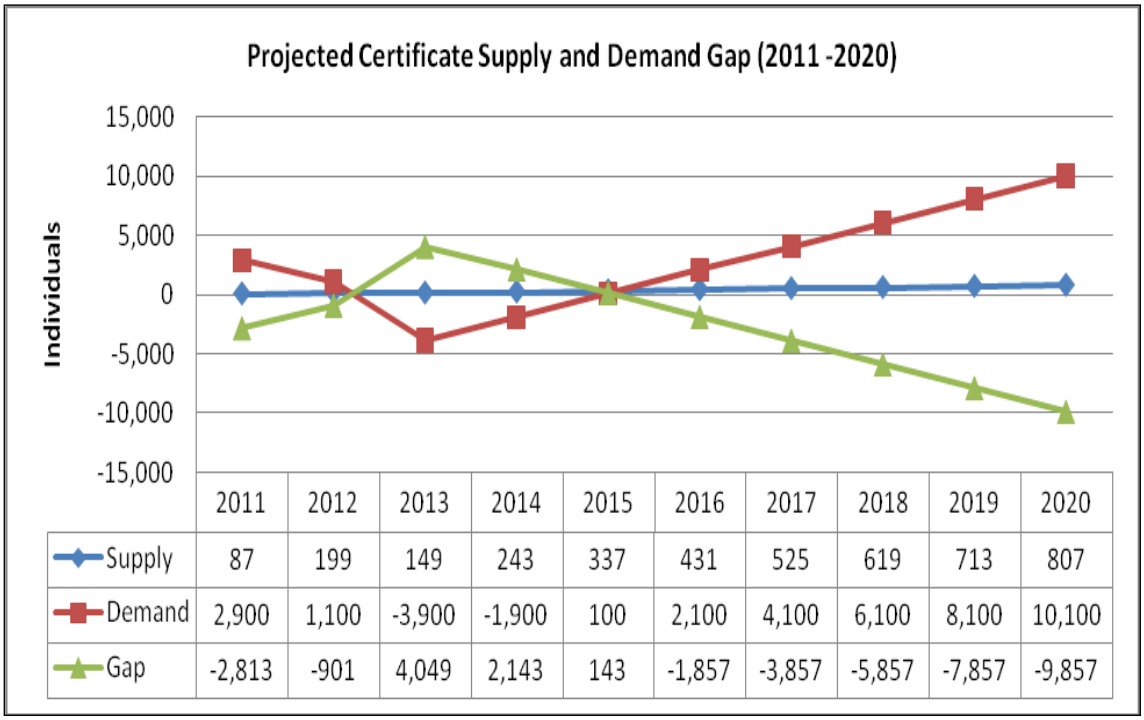
Figure 4.15: Projected Supply and Demand Gap by Aggregate (2011 -2020)

The graph above shows the supply and demand gap towards year 2020 of qualified workers, ranging from certificate level to degree level. It can be seen that the gap will increase from -3,364 to 27,239 throughout the nine year span resulting in an undersupply of qualified workers projected towards the year 2020. This however, is

a linear projection and can be avoided by increasing the supply of qualified workers to enter the industry by the year 2020. Currently efforts are already underway in terms of the aviation related courses and programmes offered either in the skills training or academic sector.

On a positive note, this undersupply is actually due to an increased demand of workers in the aviation industry towards the year 2020. The following graphs show projection by the different levels of qualifications which are certificate, diploma and degree.

4.6.6 Projected Certificate Supply and Demand Gap (2011-2020)

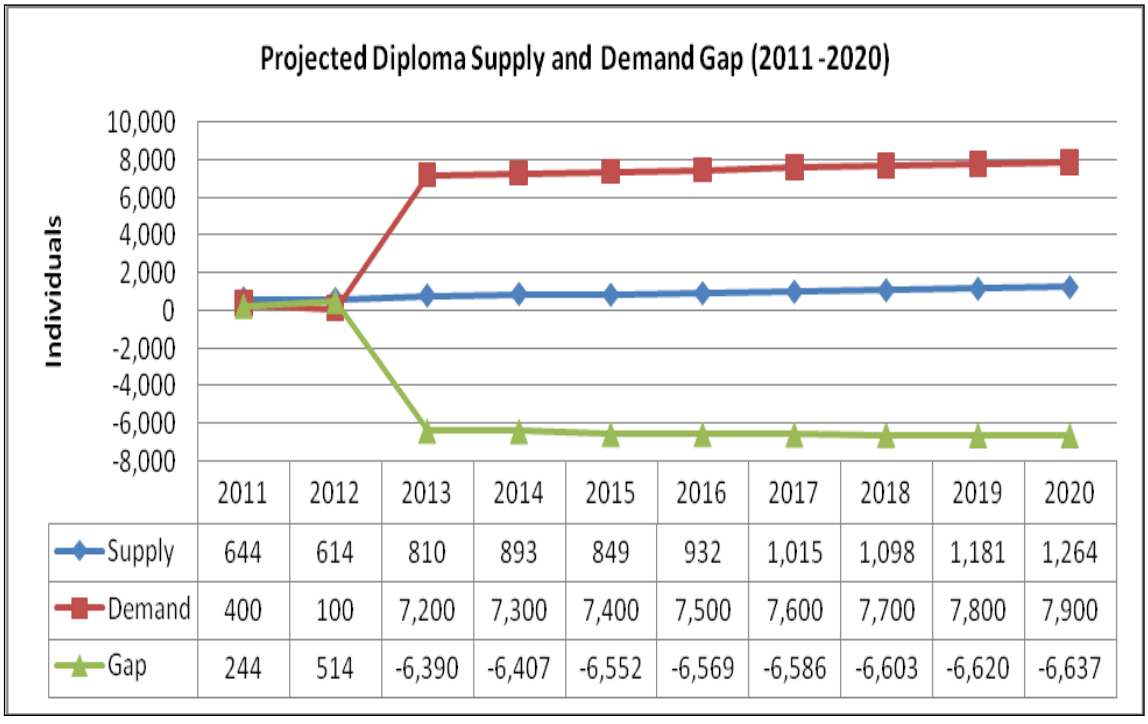


	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Supply	87	199	149	243	337	431	525	619	713	807
Demand	2,900	1,100	-3,900	-1,900	100	2,100	4,100	6,100	8,100	10,100
Gap	-2,813	-901	4,049	2,143	143	-1,857	-3,857	-5,857	-7,857	-9,857

Figure 4.16: Projected Certificate Supply and Demand Gap (2011 -2020)

There can be seen a drop of demand resulting in an undersupply of -1,857 certificate level workers in the year 2016 and gradually the undersupply increased to -9,857 certificate level graduates to fill the demand of the aviation industry in the year 2020. This does not show that certificate level workers are not required, but it implies the opposite, that there is not enough supply of certificate level workers. This is reflected by the earlier critical job titles identified at certificate level 1, 2 and 3 , namely under the Ground Handling, Air Cargo Handling, Airport Operation & Management , MRO and Airline Operation sub-sectors.

4.6.7 Projected Diploma Supply and Demand Gap (2011-2020)

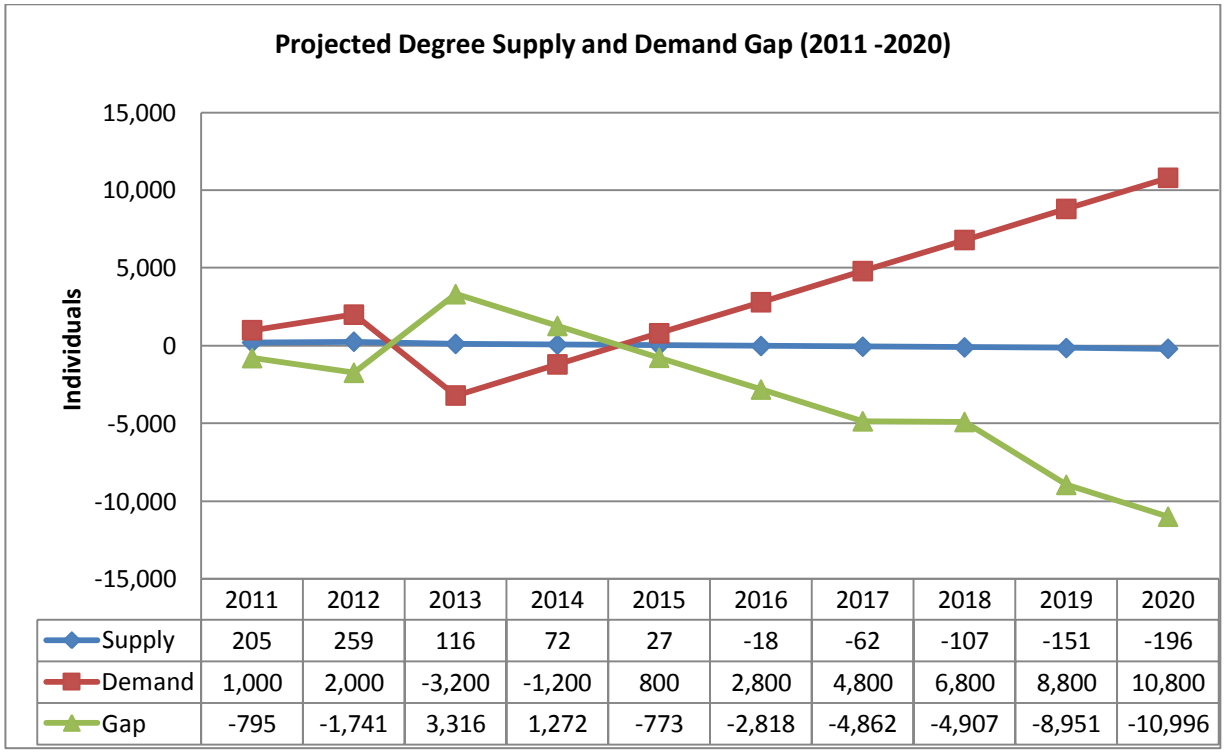


	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Supply	644	614	810	893	849	932	1,015	1,098	1,181	1,264
Demand	400	100	7,200	7,300	7,400	7,500	7,600	7,700	7,800	7,900
Gap	244	514	-6,390	-6,407	-6,552	-6,569	-6,586	-6,603	-6,620	-6,637

Figure 4.17: Projected Diploma Supply and Demand Gap (2011 -2020)

The graph above shows adequate supply of diploma level workers in the year 2011 with a gap of 244 individuals, however, there starts to be an undersupply of diploma level workers in the year 2013 with -6,390, implying that 7,200 diploma level graduates were required in the industry. This projection may also be effected by the linear projection used in calculation and the available statistics of diploma level students in the time span of 2011 till 2013 showing a small increment of diploma graduates supply. In order to avoid this projected undersupply, the supply of diploma holders should be increased with the increase of diploma level programmes according to industry demands in terms of job areas and skills required.

4.6.8 Projected Degree Supply and Demand Gap (2011-2020)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Supply	205	259	116	72	27	-18	-62	-107	-151	-196
Demand	1,000	2,000	-3,200	-1,200	800	2,800	4,800	6,800	8,800	10,800
Gap	-795	-1,741	3,316	1,272	-773	-2,818	-4,862	-4,907	-8,951	-10,996

Figure 4.18: Projected Degree Supply and Demand Gap (2011 -2020)

The graph above shows that there was an adequate supply of degree holders in the year 2013 and 2014. However, in the year 2015, due to the linear projection calculation used, the supply of degree holders started to decline resulting in an undersupply of -10,996 degree holders in the year 2020. Efforts to increase degree holder output in the near future is timely, additionally by adding a wider range of aviation industry related courses at the degree level. As identified in the list of critical job titles, degree level holders are mostly required under the MRO sub-sector that covers aircraft engineering, aviation maintenance and manufacturing. It must be noted that the negative supply of degree holders do not show that there is a decreased demand for degree programmes, but it implies the opposite, that more degree programmes relevant to the aviation industry are required to fullfill the worker demand in the aviation industry in the next 6 years.

4.6.9 Synthesis of Findings

Based on the findings both from quantitative and qualitative approaches, the final synthesis is as below.

Table 4.17 : Synthesis of Findings

No	Occupational Structure Sub Sectors (With panel members)	MSIC 2008 Classification Groups	International Benchmarking	Selected Best Practice
1	Air Cargo Handling	Cargo Handling (5224)	None Available	Air Cargo Handling
2	Ground Handling	Support Activities for Transportation (522)	Airports, International Airports, Domestic Airports	Ground Handling
3	Maintenance, Repair and Overhaul (MRO)	Manufacture of air and spacecraft and related machinery (303), Repair and maintenance of aircraft engine instruments (311)	Maintenance, Engineering, Manufacturing, Aircraft, Aircraft Safety	Maintenance, Repair and Overhaul (MRO)
4	Airline Operation	Passenger Air Transport (511)	Airlines, Flight Operations	Airline Operation

From the table shown above, the sub sectors are similar to those in the MSIC and in other international countries in relevance to the aviation sub sector.

In terms of critical job titles, in the session with the panel members, they had highlighted that the critical job titles are as much as 36 job titles in demand. These job titles are mainly under the MRO and Ground Handling sub sector at Level 2 which is equivalent to Certificate level in the Malaysian Qualifications Framework. This is further proven in the statistics that have analysed the industry in terms of supply, demand and Supply and Demand gap, showing a high demand of qualified workers in the aforesaid sub-sectors and level of competency.

4.7 CHAPTER CONCLUSION

Based on this chapter, the sub-sectors that have been identified reflect the main sub-sectors in the Aviation industry. The visual representations of the Occupational Structures and Occupational Area Structures will enable the industry to be interpreted at a glance in terms of levels of competency and available career paths. The identification of critical job titles and Supply and Demand analysis are important in determining the manpower demands of the Aviation Industry.

5. CONCLUSION AND RECOMMENDATION

5.1 CHAPTER INTRODUCTION

This chapter will further explain the conclusion obtained based on the synthesis of findings and various output of research. This will be followed by the recommendations as put forth by the researcher based on input throughout the development of this OA.

5.2 CONCLUSION

The conclusion is divided into the earlier objectives of the research as elaborated below:

i. Objective 1: Occupational Structure and Occupational Area Structure

Based on the findings obtained throughout the Occupational Analysis on the Aviation Industry, a total of 5 sub sectors and 342 job titles were identified. A number of 36 critical job titles were identified through Focus Group Discussions where the majority of the critical job titles were under the MRO sub sector.

This result matched those of the Demand Analysis done based on the MSIC classification groups which had also shown that most of the workers in demand were in the MRO, Ground Handling and Airport Operation and Management sub sectors.

ii. Objective 2: Supply and Demand Analysis

Based on the Supply and Demand Analysis by Qualifications for the year 2011 till 2013 which were the analysis of historical data demand analysis, it can be concluded that the there was an aggregate oversupply of 975 individuals consisting of certificate, diploma and degree holders in year 2013.

The projected Supply and Demand Analysis for the year 2011 till 2020 showed an undersupply of -9857 certificate level graduates in the year 2020, this does not show that certificate level workers are not required, but it implies quite the opposite, that there is not enough supply of certificate level workers. This is reflected by the earlier critical job titles at certificate level 1, 2 and 3 , namely under the Ground Handling, Air Cargo Handling, Airport Operation & Management , MRO and Airline Operation sub-sectors. For diploma holders, the projected Supply and Demand gap analysis show an undersupply of diploma level workers in the year 2020 with -6637. This projection may also be effected by the linear projection used in calculation and the available statistics of diploma level students in the time span of the historical data provided (2011 – 2013). In order to avoid this projected undersupply, the supply of diploma holders should be increased.

Finally the Supply and Demand gap for degree holders show an undersupply of -8996 degree holders in the year 2020. It is suggested that efforts to increase degree holder output in the near future may involve adding a wider range of aviation industry related courses at the degree level. As identified in the list of critical job titles in previous sections, degree level holders are mostly required under the MRO sub-sector that covers aircraft engineering, aviation maintenance and

manufacturing. Personnel from the airport operation and management sub-sector have also stated that there is an increase of demand for degree holders in courses relevant to the aforesaid area. The negative supply of degree holders do not show that there is a decreased demand for degree programmes, but it implies the opposite, that more degree holders are required to fullfill the worker demand in the aviation industry in the next 6 years.

The increasing demand of qualified workers in the Aviation Industry from 2014 until 2020, is in line with the EPP 1: Growing Aviation Maintenance, Repair and Overhaul Services under the Business Services ETP, that had projected 20,740 jobs by the year 2020. This is based on the target of developing Malaysia into a regional aviation maintenance, repair and overhaul (MRO) services hub, capitalising on global market growth that is projected to reach RM205 billion by 2020.[26]

5.3 RECOMMENDATION

Referring to Malaysia's economical plans and vision for the coming years, a framework of the Aviation industry workforce has been identified. It is hoped that the result of this Occupational Analysis will be able to be used as reference as how to fulfill the future plans of developing skilled personnel and certifying Malaysians in this industry towards improving the quality of the local industry and at boosting Malaysia's global competitiveness. There are several options when addressing or mitigating

[26] EPP 1: Growing Aviation Maintenance, Repair and Overhaul Services http://etp.pemandu.gov.my/Business_Services-@-Business_Services_-_EPP_1-;_Growing_Aviation_Maintenance,_Repair_and_Overhaul_Services.aspx#sthash.KjCwGkzk.dpuf

workforce gaps. Broad themes might include influencing demand, which may include:

- Influencing the internal or external business drivers through policy reform
- Influencing supply, which may include establishing and maintaining partnerships with other agencies or departments, or educational institutions to increase external talent pools and the talent pipeline
- Training existing staff in line with new skill requirements.

Therefore, specific recommendations are as follows:

1. To streamline the development of the NOSS under the aviation Industry in line with the findings of this analysis, specifically based on the OS and OAS and Supply and Demand findings.
2. Establishment of an Industry Lead Body for the Aviation Industry in general and ensuring membership by all 5 areas (MRO, Air Cargo Handling, Airport Operations and Management, Ground Handling and Airline Operations).
3. Encourage apprenticeship training, especially at certificate level to be run for the areas identified suitable under the Aviation Industry.
4. Increase of degree level programmes encompassing more relevant areas under the aviation industry to fulfill the worker demand in these areas.

In order to close the gap between training agencies and industry demands, the industry should strategise in aligning training to be conducted by airlines and airport operation based training centres that have been accredited to follow the safety regulations of the international and local authority and statutory bodies. This way, the trainees will have more marketability in the labour market as they are trained closely to what is

required by the industry. This will also save the cost for the industry as they do not have to retrain as the basic training is in-line with the demands of the industry and international safety regulations pertinent to aviation. The design of more courses relevant to the aviation industry, namely by adding courses under the Ground Handling, Airport Operations and Management and Airlines Operation at Certificate and Diploma level is also encouraged.

In terms of research methodology, the research team for this OA suggest that a review of the supply and demand should be done due to certain limitations in obtaining supply and demand data at the current point of research. A more exhaustive survey obtaining primary data from industry players is highly recommended.

5.4 CHAPTER CONCLUSION

Based on the conclusion and recommendations highlighted in this chapter, it is hoped that this research has provided information on the current occupational situation of the Aviation Industry in terms of Occupational Structure, Supply and Demand statistics and suggested recommendations to enhance the training of workers for the betterment of the industry in the near future.

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ANNEX 1: MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF) LEVEL DESCRIPTOR

MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF) LEVEL DESCRIPTOR

Level	Level Description
1	Achievement at this level reflects the ability to use relevant knowledge, skills and procedures to **complete routine and predictable tasks** that include responsibility for completing tasks and procedures subject to **direction or guidance**
2	Achievement at this level reflects the ability to select and use relevant knowledge, **ideas**, skills and procedures to **complete well-defined tasks and address straightforward problem**. It includes **taking responsibility** for completing tasks and procedures, **and exercising autonomy** and **judgment** subject to overall direction or guidance
3	Achievement at this level reflects the ability to **identify and use relevant understanding,** methods and skills to **complete task** and address problems that are well defined with a **measure of complexity.** It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgments **within limited parameter.** It also reflects awareness of different perspectives or approaches within an sub-area of study or work
4	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address problems that are well defined but **complex and non-routine**. It includes taking responsibility for overall courses of action as well as exercising autonomy and **judgment within fairly broad** parameters. It also reflects **under-standing of different** perspective or approaches within an sub-area of study or work
5	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address **broadly-defined, complex problem**s. It includes taking responsibility for **planning and developing courses** of action as well as exercising autonomy and judgment within broad parameters. It also reflects **understanding of different perspectives, approaches or schools of thought and the reasoning behind them**
6	Achievement at this level reflects the ability to **refine** and use relevant understanding, methods and skills to address **complex problems that have limited definition**. It includes taking responsibility for planning and developing courses of action **that are able to underpin substantial change or development, as well as exercising broad autonomy and judgment.** It also reflects an understanding of different perspectives, **approaches of schools of thought and the theories that underpin them**

Level	Level Description
7	Achievement at this level reflects the ability to **reformulate** and use relevant understanding, methodologies and approaches to address **problematic situations** that involve many interacting factors. It includes taking responsibility for **planning and developing** courses of action that initiate or underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding **of theoretical and relevant methodological perspectives, and how they affect their sub-area of study or work**
8	Achievement at this level reflects the **ability to develop original understanding** 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 DEVELOPMENT PANEL AND FACILITATORS

LIST OF INDUSTRY PANEL MEMBERS FOR THE AVIATION INDUSTRY OCCUPATIONAL ANALYSIS DEVELOPMENT

NO	NAME	EXPERTISE	POSITION	ORGANISATION
1	En. Syed Othman bin Syed Abd Rahman	Ground Handling	Head of Aircraft Maintenance & Engineering	KLAS Engineering Services Sdn Bhd
2	En. Wahidin bin Abd Wahid	Airlines	Duty Manager/Trainer	Air Asia X Berhad
4	En. Muhamad Rasidi Md Tahir	Airlines	Senior Manager	Air Asia X Berhad
3	En. Shahrul Nizam bin Harun	Maintenance Repair Overhaul (MRO)	Training Manager	Nusantara Aerotech Sdn Bhd
5	Datuk Kapten Nik Ahmad Huzlan bin Nik Hussain	Airlines	Consultant	Freelance
6	En. Mustiran bin Abd Kadir	Ground Handling	Manager	MnM Services Sdn Bhd
7	Ahmad Bakhtiar bin A.Hashim	Aircraft Ground Handling	Human Resources Manager	Nusantara Aerotech Sdn Bhd
8	Mr. Kanaga Raj	In-flight Services	Trainer	Edufly Aviation Academy
9	Capt Ab Manan Mansor	Airlines	Chief Executive	Aviation Management College

LIST OF FACILITATORS FOR THE AVIATION INDUSTRY OCCUPATIONAL ANALYSIS DEVELOPMENT

FACILITATORS

DR. AMIRON ISMAIL

EVARINA AMIRON

MILLENIUM IMPRESS SDN BHD

DOCUMENTOR/RESEARCHER

NORFADILAH ITHNIN

NOORSHAHIDAH AHMAD

MILLENIUM IMPRESS SDN BHD

PROOFREADER

MR. MANJIT SINGH

ANNEX 3 : OCCUPATIONAL STRUCTURE (OS)

ANNEX 4 : OCCUPATIONAL AREA STRUCTURE (OAS)