



# Aerospace Education & Training Industry Reference Committee (IRC)

## **MEA Aeroskills Training Package**

**IRC Skills Forecast and Proposed Schedule of Work 2017-2021**

**April 2017**

[www.ibsa.org.au](http://www.ibsa.org.au)

[manufacturing@ibsa.org.au](mailto:manufacturing@ibsa.org.au)

(03) 9815 7099

Level 11, 176 Wellington Parade  
East Melbourne, Victoria, 3002



*Prepared on behalf of the Aerospace Education & Training IRC for the Australian Industry Skills Committee (AISC)*

## **IRC Skills Forecast and Proposed Schedule of Work 2017-2021**

This IRC Skills Forecast and Proposed Schedule of work 2017-2021 has been produced with the assistance of funding provided by the Commonwealth Government through the Department of Education and Training.

IBSA also acknowledges the September 2016 Four Year Work Plan, produced by Manufacturing Skills Australia (MSA), on which this version is based.



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## Executive Summary

The Aerospace Industry Skills Forecast and Proposed Schedule of Work, links the sector trends, workforce skill priorities and training plan to effectively meet the future skill needs of this sector in transition by:

- providing an understanding of the industry including its primary activities, its size and sub sectors, type and location of employers, and opportunities and challenges (*Sector Overview*);
- outlining the critical workforce challenges and opportunities (*Employment*);
- forecasting future skills priorities by describing trends in workplace and job design (*Skills Outlook*); and
- proposing and prioritising training product development and review activities (*Training Product Review Plan*).

This April 2017 update to the Aerospace Industry Skills Forecast and Proposed Schedule of Work augments the earlier work plan submitted in September 2016 with an executive summary, incorporation of updated priorities for training product development and review following recent consultations with the Aerospace Education and Training Committee Industry Reference Committee (IRC) and State Training Authorities.

### What is the aerospace industry?

The Australian aerospace industry consists of three segments:

- aircraft and aircraft parts manufacturing;
- civilian aircraft repair and maintenance; and
- military aircraft repair and maintenance.

The highly regulated aerospace industry is concentrated on the eastern seaboard, in particular Queensland which has a strong Maintenance, Repair and Overhaul sector. The majority of businesses operate as non-employers or small businesses and are geographically dispersed to service local needs. The 2016 Defence White Paper and expected growth in passenger air travel in the Asia Pacific underpin forecasts for industry growth.

The impact of new automation technologies such as Remotely Controlled Aircraft Systems and advanced materials is becoming increasingly evident in both civil and defence applications. The aerospace industry is an example of advanced engineering requiring through life support services that can take advantage of a global value chain. Australia's aerospace research and development capacity confirms our role in down-line global supply chains.

### Critical workforce challenges and opportunities

General Aviation has an ageing workforce, largely servicing an ageing fleet and extensive national and international licensing requirements. These challenges are compounded by research indicating a global workforce shortfall of 30% in aircraft maintenance capacity by 2025.

Stakeholder feedback highlights other workforce supply side challenges including:

- the introduction of new technologies in the new aircraft such as generation 3 electrical wire interconnect systems (EWIS), remote monitoring and robotics;
- working with the new composite materials;
- compliance with international standards, in particular the European Aviation Safety Agency (EASA);
- the lack of training institutions and suitably qualified trainers;
- a geographically dispersed workforce impacting recruitment as well as retention and leading to thin markets for training providers; and

- new job entrants lacking the basic skills and knowledge to succeed in the industry, including: the required science, technology, engineering and mathematics (stem) skills, foundation skills and hand skills.

## Forecasting skills priorities

The skills priorities have been informed by international and national trends and stakeholder feedback.

Workplace and job design are being impacted by new technologies which are revolutionising automation and requiring workers to develop new skills including digital programming, advanced electronics, robotics and data analysis and new ways of working. Multiskilling offers workers mobility between sectors which is becoming more critical particularly when operating in an international global regulatory environment. For the Australian Defence Force (AF), additional factors impacting on workplace and job design are complex multi-skills systems, ADF aircraft fleet requirements for through life support and logistics support analysis.

## Training Package priorities

The Training Package Review Plan 2017-18 to 2020-21 was developed by the IRC with support from IBSA Manufacturing based on identified industry trends. This plan lists the priorities over the next four years, the rationale for these priorities, and the proposed scope and timeframes for these activities.

The items identified as critical and proposed for inclusion as a priority for the 2017-2018 schedule of work are:

- evaluate compliance of Training Products with International Civil Aviation Organization (ICAO) skill standards, and
- evaluate adequacy of skills for support systems.

The IRC Skills Forecast and Proposed Schedule of Work 2017-18 to 2020-21 table provided at the end of this document lists the priorities for subsequent years.

## Administrative Information

**Name of Industry Reference Committee (IRC):** Aerospace Education & Training

**Name of Skills Service Organisation (SSO):** Innovation & Business Skills Australia (IBSA Manufacturing)

## Sector Overview

### Aerospace - Snapshot of the industry

The aerospace industry plays a critical role in supporting comprehensive national aviation manufacturing and maintenance networks, defence-related needs and associated technical activities. The industry is a significant contributor to the Australian manufacturing sector.

The Australian aerospace industry consists of three segments:

- aircraft and aircraft parts manufacturing
- civilian aircraft repair and maintenance
- military aircraft repair and maintenance<sup>1</sup>

The Aerospace industry includes maintenance, repair and overhaul services for general aviation, airlines and the Australian Defence Force (ADF). Although the ADF is a part of this industry, data regarding employment numbers (including contractors) and usage of the MEA Training Package is not publicly available.

Information is gathered using the Australian New Zealand Standard Industrial Classification (ANZSIC) system which was reviewed in 2006. The Aerospace industry is classified in the following subdivision in Division C:

- Subdivision 23 – Transport Equipment Manufacturing
  - Group 239 Other Transport Equipment Manufacturing
    - Class 2394 Aircraft Manufacturing and Repair Services

It does not include the manufacture of:

- Hang gliders (Class 2593 Toy, Sporting and Recreational Product Manufacturing), or
- Hovercraft (Class 2399 Other Transport Equipment Manufacturing not elsewhere classified)

There are 25 qualifications in the MEA Training Package:

- MEA20415 Certificate II in Aeroskills
- MEA20515 Certificate II in Aircraft Line Maintenance
- MEA20615 Certificate II in Aircraft Surface Finishing
- MEA30115 Certificate III in Aircraft Surface Finishing
- MEA30215 Certificate III in Aeroskills (Mechatronics)
- MEA30315 Certificate III in Aircraft Life Support and Furnishing
- MEA40615 Certificate IV in Aeroskills (Avionics)
- MEA40715 Certificate IV in Aeroskills (Mechanical)
- MEA40915 Certificate IV in Aircraft Surface Finishing

<sup>1</sup> IBISWorld, 2016, C2394 Aircraft manufacturing and repair services in Australia

- MEA41015 Certificate IV in Aeroskills (Mechatronics)
- MEA41115 Certificate IV in Aircraft Life Support and Furnishing
- MEA41215 Certificate IV in Aeroskills (Armament)
- MEA41315 Certificate IV in Aeroskills (Structures)
- MEA50115 Diploma of Aeroskills (Avionics)
- MEA50215 Diploma of Aeroskills (Mechanical)
- MEA50315 Diploma of Aviation Maintenance Management (Avionics)
- MEA50415 Diploma of Aviation Maintenance Management (Mechanical)
- MEA50515 Diploma of Aeroskills (Non-Destructive Testing)
- MEA50615 Diploma of Aeronautical Engineering
- MEA50715 Diploma of Avionic Engineering
- MEA60115 Advanced Diploma of Aviation Maintenance Management (Avionics)
- MEA60215 Advanced Diploma of Aviation Maintenance Management (Mechanical)
- MEA60315 Advanced Diploma of Aviation Non-Destructive Testing
- MEA60415 Advanced Diploma of Aeronautical Engineering
- MEA60515 Advanced Diploma of Avionic Engineering

*Note: Unless otherwise stated the data included is only for the ANZSIC subdivision listed above.*

*Note: MSA used as its main data sources, the latest statistics available from the Australian Bureau of Statistics (ABS) and the National Centre for Vocational Education Research (NCVER). This may result in variations between the data collected. MSA also used information provided by IBISWorld to support projections for future skill development.*

## **Business numbers and size**

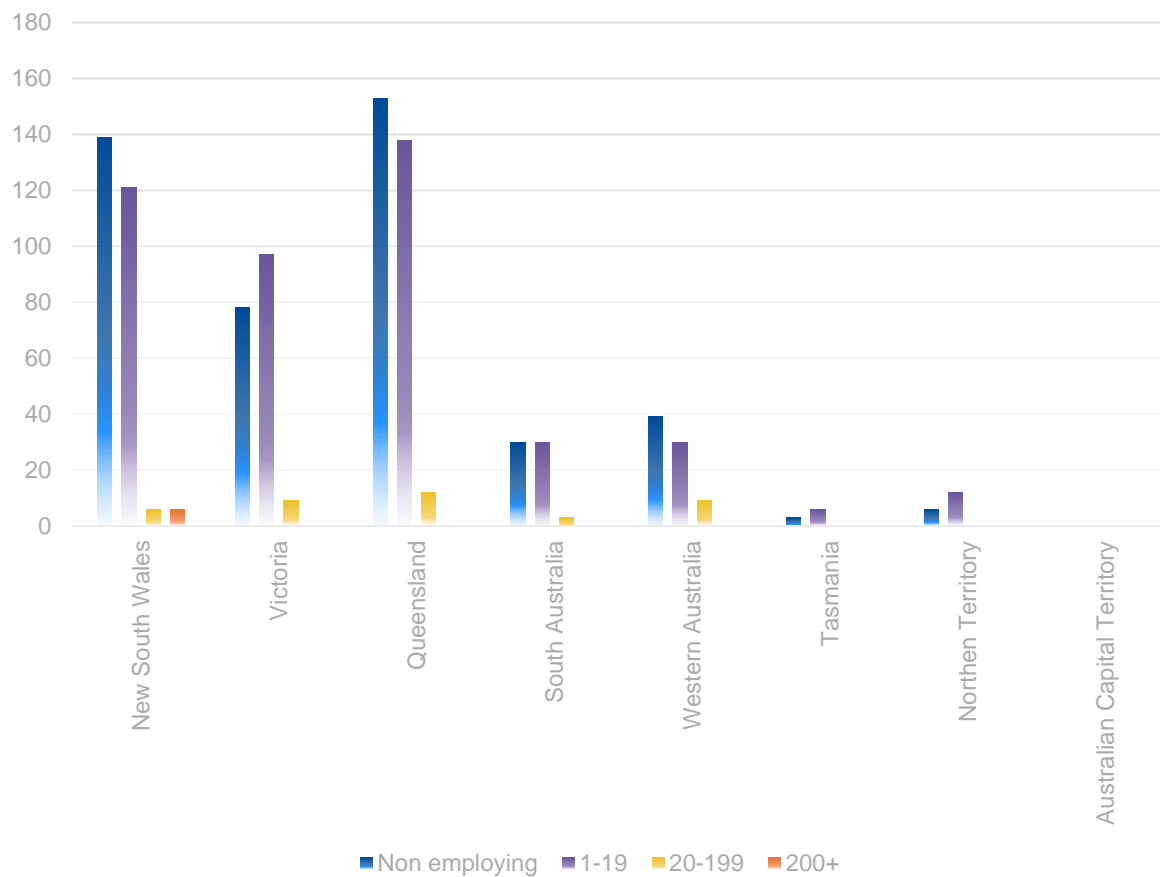
In 2009, the largest number of businesses (303) were in Queensland. New South Wales had 272<sup>2</sup>. This reflected the growth of the Maintenance, Repair and Overhaul (MRO) sector in Queensland.

*Note: Businesses have been classified according to the number of employees.*

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<sup>2</sup> Australian Bureau of Statistics, 2010, Counts of Australian Business including entries and exits, June 2007 to June 2009

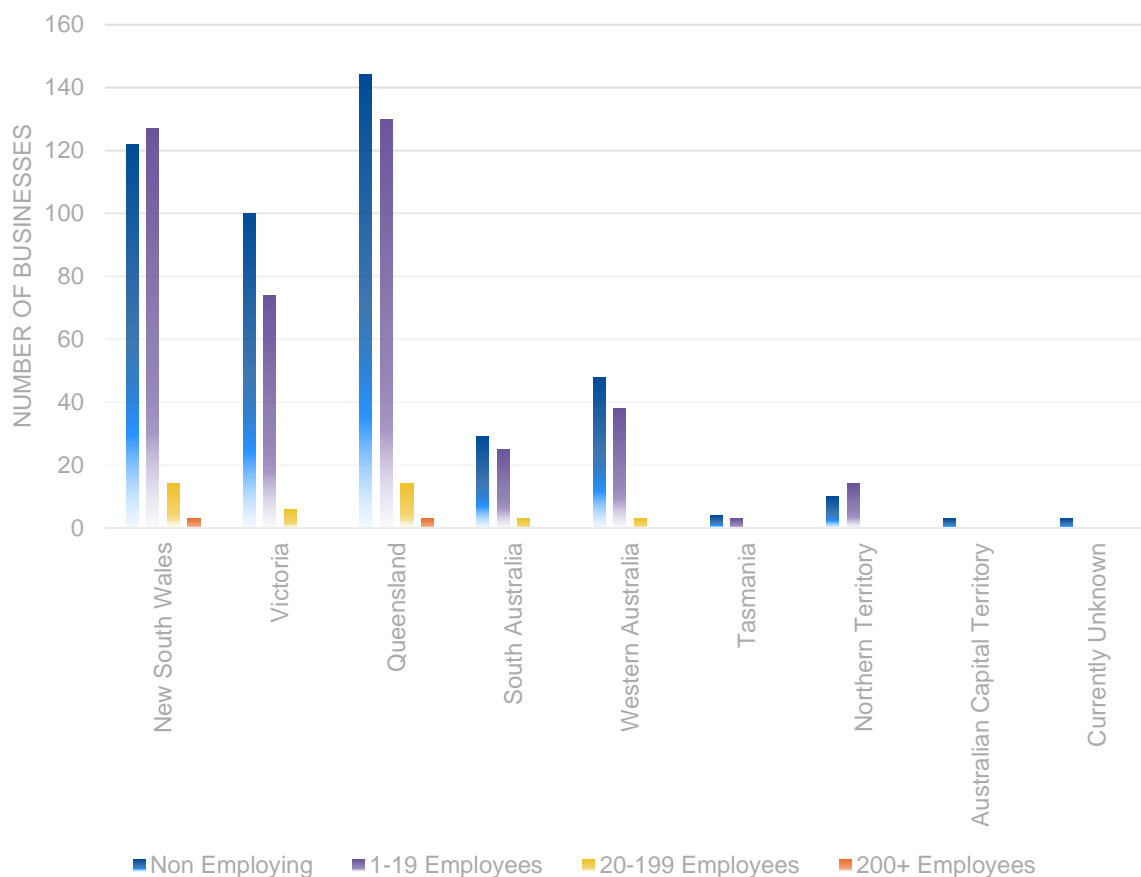
## Aircraft manufacturing and repair services, Australia Businesses by state June 2009



Source: ABS Counts of Australian Businesses June 2007 to June 2009



## Aircraft manufacturing and repair services, Australia Number of businesses by state and size, June 2015



Source: Australian Bureau of Statistics, 2016, Counts of Australian Businesses, including entries and exits, 2014-15

Over the period (2009 – 2015) the majority of businesses in the sector were located in Queensland, New South Wales and Victoria. Aside from a small spike in Queensland 2012, the number of businesses operating remains steady in each state, reflecting the strength of the sector. South Australia, Western Australia and Tasmania have shown marginal decline across all business sizes, while New South Wales has seen losses in the businesses with 200+ employees. This may be balanced out by an increase in businesses with 20-199 employees in New South Wales.<sup>3</sup> Overall the sector remains strong despite the decision by Qantas to move some deep maintenance operations overseas<sup>4</sup>.

The industry is dominated by micro and small businesses reflecting the fragmented and geographically dispersed nature of the MRO sector. According to IBISWorld, over 50% of businesses in the industry are sole operators who are mainly engaged in MRO operations as contractors. While these businesses make the majority of the industry,

<sup>3</sup> Australian Bureau of Statistics, 2016, Counts of Australian Businesses including entries and exits, 2014-15

<sup>4</sup> Manufacturing Skills Australia, 2015, Manufacturing Advancing the Conversation, MSA Environmental Scan 2015. <http://mskills.org.au/industry-intelligence/info/environmental-scan>

they generate only a small part of industry revenue. It is the large multinational aircraft parts/frames and aircraft manufacturers who generate the majority of industry revenue.<sup>5</sup>

Australia participates in the global aircraft manufacturing industry through the manufacturing of aircraft components for the large multinationals. Boeing Australia Holdings (US owned), Airbus Group Australia Pacific (French owned) and BAE Systems (UK owned) have a strong presence in Australia, operating across a number of sectors in the supply chain. For example, Boeing Australia has a subsidiary, Jeppesen Australia, which provides information technology services to Boeing.<sup>6</sup> There also a number of companies, for example Marand, an engineering company<sup>7</sup>, who are involved in providing specific components as part of the Joint Strike Fighter (JSF) project. Defence aerospace manufacturing is a large part of the Australian aircraft manufacturing sector. It is expected that the recently released 2016 Defence White Paper and its supporting Defence Industry Policy Statement will provide additional significant opportunities for this sector.<sup>8</sup>

Businesses operating in the aircraft manufacturing sector are leading the way in advanced manufacturing by developing and patenting new processes. For example, Quickstep have developed a patented out-of-autoclave production technology for advanced composite materials<sup>9</sup>. The technology is constantly changing and the use of advanced materials such as composite carbon fibres and titanium is also increasing. The desire to decrease aircraft weight and increase fuel efficiencies are driving much of this change. There is also increased industry-based research and development (R&D).<sup>10</sup>

Australia has a few small aircraft manufacturers who mainly produce light aircraft (1 to 4 seaters) often for specialist purposes, e.g. Jabiru Aircraft Australia<sup>11</sup>. Gipps Aero, Australia's only utility aircraft manufacturer, is majority owned by the large Indian conglomerate, Mahindra Group and much of the manufacturing process has been moved to India, leaving mainly the research and design capabilities here.<sup>12</sup>

The maintenance, repair and overhaul (MRO) sector is predominately micro and small businesses. There are two significant companies, TAE and Hawker Pacific, who provide MRO services to a range of customers, ranging from the Australian Defence Force (ADF), and major aircraft manufacturers to General Aviation (GA) and agricultural operators.<sup>13</sup><sup>14</sup> The major airlines, Qantas, Virgin and Rex manage their own maintenance, either in-house or offshore. One of the challenges facing the MRO sector has been the offshoring of deep maintenance by Qantas (Boeing 747 / Airbus A380 aircraft) and rationalisation of other maintenance carried out by Qantas - Boeing 737 and Airbus A330 aircraft previously maintained in Melbourne into Brisbane - and Virgin, leading to significant job losses. At the same time the general aviation sector has been experiencing a critical shortage of Aircraft Maintenance Engineers (AMEs) and Licensed Aircraft Maintenance Engineers (LAMEs). However, workers coming from Qantas

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<sup>5</sup> IBISWorld, 2015, Aircraft Manufacturing and Repair Services in Australia

<sup>6</sup> Boeing Australia, <http://www.boeing.com.au/boeing-in-australia/about-boeing-in-australia.page>

<sup>7</sup> Marand, <http://www.marand.com.au/>

<sup>8</sup> Department of Defence, 2016, [www.defence.gov.au](http://www.defence.gov.au)

<sup>9</sup> Quickstep, <http://www.quickstep.com.au/Capabilities/Quickstep-Curing-Process>

<sup>10</sup> IBISWorld, 2015, Aircraft Manufacturing and Repair Services in Australia

<sup>11</sup> Jabiru Aircraft Australia, <http://www.seabirdaviation.com.au/pages/>

<sup>12</sup> Mahindra Aerospace, <http://www.mahindraaerospace.com/>

<sup>13</sup> TAE company website, <http://www.tae.com.au/about-us/>

<sup>14</sup> Hawker Pacific website, <http://www.hawkerpacific.com/>

and Virgin have not been able to transfer to the GA sector without undertaking significant reskilling to gain the appropriate licenses.<sup>15</sup>

According to IBISWorld data, the industry is projected to grow over next four to five years, driven by increased demand in the Asia-Pacific region and increased Defence spending.<sup>16</sup>

The Queensland Government is currently developing a Queensland Aerospace 10 Years Roadmap: the Discussion Paper was released for external consultation in May. A copy is available on the Department of State Development's website.<sup>17</sup> The Queensland Defence 10 Years Roadmap is also due to be released this year. Both of these documents will supply additional information in relation to the aerospace industry in Queensland.

## Regulation of industry

- IBSA provides comprehensive coverage of the aerospace manufacturing and engineering industry through the MEA Training Package, designed to meet civil and military aviation needs.
- As part of this comprehensive coverage, the MEA Training Package assists the regulator and industry interface by providing national qualifications and approved skill sets for transition to new Civil Aviation Safety Authority (CASA) regulatory and licensing requirements.
- The safety regulation of military air operations for state aircraft is conducted by the Directorate General of Technical Airworthiness (DGTA).

## Civil

- The government statutory authority responsible for the regulation of civil aviation is the Civil Aviation Safety Authority (CASA).
- CASA's key role is to conduct the safety regulation of civil air operations in Australian territory and the operation of Australian aircraft outside Australian territory.
- CASA has a direct regulatory relationship with civil aviation stakeholders, including LAMEs whose skills training pathways are covered by the MEA Training Package.
- To illustrate the direct, detailed and ongoing CASA interface with the MEA Training Package, see the MEA Aeroskills Training Package CASA Licensing Requirements Companion Volume<sup>18</sup>.
- LAME licensing pathways:
  - MEA50215 Diploma of Aeroskills (Mechanical) satisfies CASA requirements for the grant, under Civil Aviation Regulation (CASR) Part 66, of Aircraft Maintenance Engineer B1 Licenses in sub-categories B1.1 and B1.3, when CASA requirements have been met (including required training delivery in accordance with CASR Part 147).
  - Likewise the MEA50115 Diploma of Aeroskills (Avionics) satisfies CASA requirements for the grant of a B2 Aircraft Maintenance Engineer License.

<sup>15</sup> University of NSW, 2015, The Future of Aircraft Maintenance in Australia, <http://mskills.org.au/industry-intelligence/ars>

<sup>16</sup> IBISWorld, 2015, Aircraft Manufacturing and Repair Services in Australia

<sup>17</sup> Department of State Development, 2016, Queensland Aerospace, 10-yr Road map Discussion paper for consultation, State of Queensland <http://www.statedevelopment.qld.gov.au/resources/paper/aerospace-roadmap.pdf>

<sup>18</sup> <http://mskills.org.au/training-packages/aerospace>

- Skill sets used as the basis for different levels of responsibility/occupations within aircraft maintenance facilities:
  - The MEA Aeroskills Skill Sets (groups of units of competency) relate to highly regulated work performed on the basis of specific task approval by either a Regulator or the maintenance organisation operating within specific regulatory requirements.
  - For example, there are Skill Sets that meet CASA requirements for the removal of existing 'exclusions' from B1 and B2 aircraft maintenance engineer licenses, and for the grant of an A license to holders of a Certificate IV in Aeroskills or a B2 license.
  - For further details see MEA Aeroskills Training Package Skill Sets Companion Volume<sup>19</sup>
- An example of the General Aviation / CASA skills development interface is ongoing work with the current MEA41015 Certificate IV Aeroskills (Mechatronics). This qualification is a competency-based training means of complying with small aircraft maintenance certification licensing requirements for CASA issued Part 66 small aircraft licences (B1.1, B1.2, B1.3, B1.4 and B2) and group ratings (proposed to be available through CASA within the next two years).
- More generally in the context of civil aviation licensing and regulatory provision, some industry stakeholders have recently flagged the possible need to review and further extend some training program components and qualification outcomes. CASA has recently met with key industry stakeholders to discuss their concerns and this may lead to further regulatory changes.
- Additionally, CASA has indicated some ongoing need for IBSA assistance related to possible extension of training program components, and implementation support to encourage training take-up for new licensing requirements. Defence has also indicated that they may have ongoing needs to review and further extend some training program components.
- Air Traffic Control skills training pathways (operational or maintenance) are not covered by the MEA Training Package.
- However, there may be areas of technical support and through-life maintenance for new ATC equipment and systems that would appropriately be covered by the MEM training package pathways (current or extended).

## Defence

- The DGTA has direct regulatory control over maintenance carried out by both uniformed aircraft maintenance personnel, and personnel of civilian aircraft maintenance contractors engaged by Defence.
- All civilian contractors and employees are required to comply with the standard Def (Aust.) 9022. Details for the standard and its relationship to the MEA Aeroskills Training Package is briefly described as follows. More detail can be found in the Standard<sup>20</sup>.

### **Def (Aust.) 9022 Requirements for Civilian Personnel Maintaining State Aircraft and Aeronautical Product**

DEF (AUST.) 9022 is applicable to the conduct of maintenance by civilian maintenance organisations, civilian maintenance management staff and tradespeople, and Defence civilians on State aircraft and aeronautical product

<sup>19</sup> Ibid

<sup>20</sup> DEF (AUST.) 9022, Requirements for Civilian Personnel Maintaining State Aircraft and Aeronautical Product, Australian Defence Standard [http://everyspec.com/ADF/DEF%28AUST%29\\_9022\\_4183/](http://everyspec.com/ADF/DEF%28AUST%29_9022_4183/)

within Australia. The Standard defines the required criteria for civilian personnel - either Defence civilians or Defence's contractors -employed on maintenance of Australian State aircraft or associated aeronautical product to satisfy the Regulations covering personnel qualifications and trade competency.

This standard is aligned with the Aeroskills Training Package for the Aerospace industry and associated Competencies under the National Training Framework. In addition to this, the Standard also attempts to harmonise to the maximum extent as practical with standards being established by CASA for civil aircraft and aeronautical maintenance.

To illustrate how the MEA training package covers the needs of military aviation maintenance, refer to the MEA50415 Diploma of Aviation Maintenance Management (Mechanical) which applies to individuals employed in aviation maintenance management fields in both the CASA and the Australian Defence Force (ADF) regulatory environments, in jobs such as mechanical maintenance team leaders, maintenance planners, and spares assessors.

## **Challenges and opportunities in the sector/sub-sector at the international/national/jurisdictional or regional level**

The following potential challenges and opportunities facing the aerospace industry have been identified by stakeholders:

### **Challenges:**

#### ***Industry wide***

- Predicted expansion of civil aviation in the Asia Pacific region
- Uptake and ongoing advances in composites
- Additive manufacturing uptake
- Impact of increased automation
- Climate change/Paris Climate Accord
- Huge growth in the use of Unmanned Aerial Systems (UAS) or (as they are increasingly been known as) Remotely Piloted Aircraft System (RPAS) bringing potential impacts including CASA regulatory provisions for maintenance and manufacture as well as new technical skill requirements.

#### ***General Aviation (GA)***

- Challenges faced in GA and Charter areas including: recruiting and retaining skilled workers; cutbacks in fly-in fly-out (FIFO) workforce for the resources sector.
- Associated issues with thin markets for training/remoteness of many GA workplaces – major commitment will be required to provide remote delivery of training programs
- Particular challenges for the GA sector in maintaining the significant fleet of ageing aircraft

#### ***Licensing and regulation***

- Impact of international standards on skills development in Australia particularly mobility of offshore maintenance
- Need for significant effort in transitioning of existing workforce to meet new licensing in the GA sector, and recruitment of new entrants to undertake trade/licensing training

- The impending release of the small aircraft licensing syllabus will have an impact in delivering a wide training package over distance for a small number of students. There is a significant challenge for Registered Training Organisations (RTOs) to meet this requirement.
- The most urgent requirement, from a civil point of view, is getting the small aircraft licensing out onto the street as presently the GA sector are very much limited in gaining a lower group licence
- Also emanating initially from the GA sector, the Aviation Maintenance Repair and Overhaul Business Association Inc. (AMROBA) has submitted its detailed concerns about the lack of skills that AMEs gain from the national VET system. Following recent discussions involving other industry organisations AMROBA now reports that this matter is acknowledged as an industry-wide issue. The industry is concerned that current licenced aircraft maintenance engineer (LAME) privileges need to be harmonised with International Civil Aviation Organization (ICAO) standards.
- Growth in use of Remotely Piloted Aircraft System (RPAS) bringing potential impacts including CASA regulatory provisions for maintenance and manufacture

Discussions with CASA regarding licensing requirements and their impact on training products are ongoing and as such may alter this list over the 2016-2020 time frame.

## Opportunities:

### **Defence**

- Opportunities to be generated from the 2016 Defence White Paper
- Opportunities from the Australian Defence Force (ADF) aircraft fleet requirements for through-life support

### **Licensing**

- Opportunities from the ongoing needs of the very vibrant national civil helicopter area to ensure access to a skilled workforce to deliver their required maintenance services, including meeting associated CASA regulatory compliance

### **Industry wide**

- National Innovation and Science Agenda (NISA)
- Uptake and ongoing advances in composites
- Additive manufacturing uptake
- Predicted growth in passenger air travel in the Asia Pacific region
- The development of aviation bio-fuels

The major workforce development challenge identified by all stakeholders, whether in the civil aerospace industry or Defence, was the need for suitably skilled workers. Some civil aerospace stakeholders expressed concern that the current system of training does not support the development of sufficient workers with the required skills and knowledge needed for the industry currently, let alone to meet the predicted increase in demand. The GA sector was identified as having major challenges including an ageing workforce servicing an ageing fleet of aircraft and dealing with new small aircraft licencing requirements coming into force.

According to research published by the University of New South Wales<sup>21</sup>, there will be a global workforce shortfall of 30% in aircraft maintenance capacity by 2025. The Asia Pacific region is predicted to have the largest growth in aircraft numbers and passenger capacity during this period, posing both a challenge and a significant opportunity for the Australian aerospace industry. Geographically and educationally, Australia is ideally positioned to take advantage of the need for skilled aircraft maintenance engineers within the region. However, the industry believes that there are a number of impediments to this at present, some of which are relevant to Training Product development. These impediments include:

- The introduction of new technologies in the new aircraft such as Generation 3 electrical wire interconnect systems (EWIS)
- Working with the new composite materials
- Compliance with international standards, in particular the European Aviation Safety Agency (EASA)
- Lack of training institutions and suitably qualified trainers
- New entrants lacking the basic skills and knowledge to succeed in the industry, including: the required science, technology, engineering and mathematics (STEM) skills; foundation skills; and hand skills

The above challenges relate to the civil aerospace industry. Defence is facing challenges relating to the introduction of new aircraft, whilst maintaining existing ageing aircraft. New technologies and materials, such as low observable coatings, are being incorporated into these new aircraft, creating challenges for upskilling of existing workers, especially when details of the skills required for the new technologies and materials are not yet available. Currently Defence is undertaking a project to examine the feasibility of developing a 'specialist technician' stream which could result in increased training requirements. This project remains in its infancy, so any impact to the Training Package is unknown at this stage.

Another challenge facing Defence is the move from the current Directorate General Technical Airworthiness (DGTA – ADF) system to a 'military-adapted' EASA style safety system format. At the moment there is insufficient information available within Defence to assess the impacts that this will have, particularly whether defence will adapt the civil system of licensing and training.

One area that is expected to present both a challenge and an opportunity for both civil and Defence is the burgeoning use of RPAS. According to CASA, this sector is expected to grow by between 200% and 500% by 2020.<sup>22</sup>

Both the National Innovation and Science Agenda (NISA)<sup>23</sup> and the 2016 Australian Defence White Paper<sup>24</sup> have been identified by stakeholders as presenting significant opportunities for the aerospace industry as a whole, although exactly what these opportunities will be has yet to be explored. Aerospace manufacturers certainly see advanced composites as a significant area of opportunity although it also poses challenges in the need to identify and train for the skills required to work with such materials. The incorporation of information technology (IT) systems

<sup>21</sup> Hampson, I., Fraser, D., Junor, A., Gregson, S., 2015, The Future of Aircraft Maintenance in Australia: Workforce Capability, Aviation Safety and Industry Development University of New South Wales, Sydney <http://www.mskills.com.au/downloads/The%20Future%20of%20Aircraft%20Maintenance%20in%20Australia.pdf>

<sup>22</sup> Aviation Business, 2016, CASA issues 500th UAV operator certificate, <http://www.aviationbusiness.com.au/news/casa-issues-500th-uav-operator-certificate>

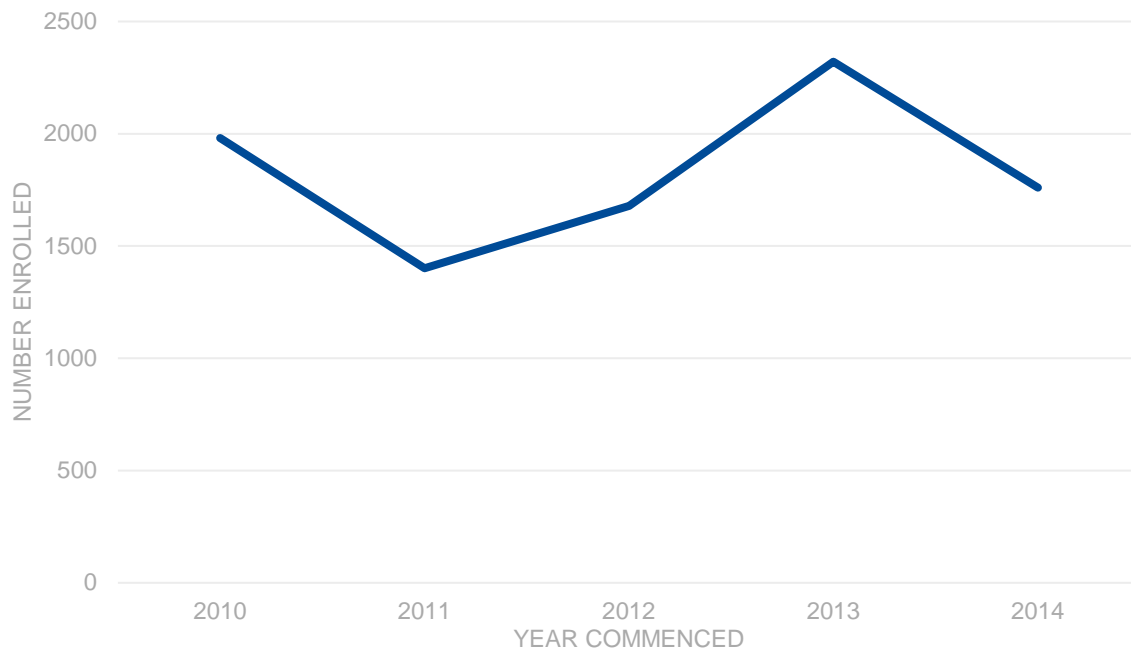
<sup>23</sup> Australian Government, 2016, National Innovation and Science Agenda, <http://innovation.gov.au/page/national-innovation-and-science-agenda-report>

<sup>24</sup> Australian Government, 2016, 2016 Defence White Paper, <http://www.defence.gov.au/whitepaper/Docs/2016-Defence-White-Paper.pdf>

(such as remote monitoring systems and feedback) into new aircraft will demand new skills in the areas of analysis and response and also in IT support and maintenance. The increasing use of robotics in aircraft manufacturing is also another area that aircraft manufacturers have identified as a growth area requiring new skills.

Enrolments in qualifications from the MEA Training Package fluctuate from year to year, as displayed in the table below. In 2014 there were a total of 2,075 enrolments in qualifications from the MEA Training Package, of which 1,760 were publicly funded.

### Enrolments in qualifications from the MEA Training Package 2010-14



Source: VOCSTATS <<http://www.ncver.edu.au/resources/vocstats.html>>, Program enrolments 2003-2014. Extracted on 11/05/16

Of the entry level qualifications, the Certificate II in Aeroskills has the greatest number of enrolments, with 182 enrolments at publicly funded institutions, and a further 140 enrolled through fee-for-service RTOs. There are 10 RTOs with the qualification on scope: eight public, one private and one enterprise RTO. The Certificate II in Aircraft Line Maintenance is delivered mainly through fee-for-service programs, with only one enrolment in a publicly funded institution and 37 through fee-for-service delivery. There are six public, one private and one enterprise RTO with this qualification on scope. The Certificate II in Aircraft Surface Finishing is not on scope at any RTOs and has had no enrolments over the past five years.

The majority of enrolments in Aeroskills qualifications can be attributed to the Certificate IV level qualifications in Aeroskills (Avionics, Mechanical, and Structures) which are the trade level qualifications for the industry. The restructure of Qantas, including closure of its heavy maintenance base in Avalon and Tullamarine, has probably contributed to the downturn in apprenticeship uptake in 2014.

The Diploma of Aeroskills (Avionics and Mechanical) show steady growth in enrolments. In 2011-2012, CASA introduced licensing changes which led to development of the Diplomas in Avionics and Mechanical to meet these

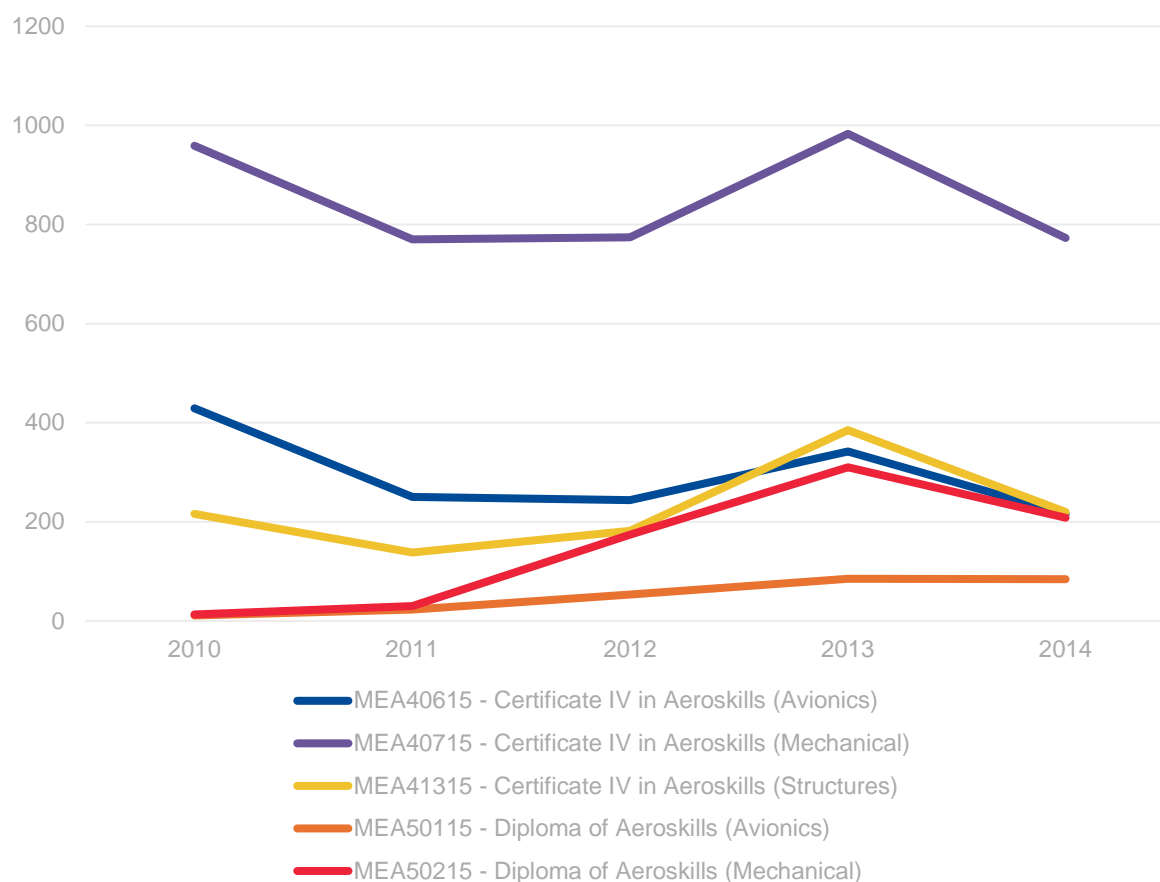


requirements, endorsed in 2015. Enrolments are expected to stay steady at this level, with existing LAMEs using relevant Skill Sets from these qualifications to maintain licenses and upskill in specialties. Two such examples are<sup>25</sup>:

- Pel-Air Aviation with 5 learners enrolled in MEASS00159 and 1 learner enrolled in MEASS00227, and,
- Regional Express with 21 learners enrolled in MEASS00159 and 3 learners enrolled in MEASS00227

*Note: Enrolment data on specific Skill Sets is not yet available through NCVET VOCSTATS. Data presented is courtesy of Manufacturing Skills Australia NWDF projects.*

## Enrolments in Certificate IV level qualifications MEA Aeroskills Training Package



Source: VOCSTATS <<http://www.ncver.edu.au/resources/vocstats.html>>, Program enrolments 2003-2014. Extracted on 11/05/16

There are other qualifications from the Aeroskills Training Package which have low or zero enrolments. These are not displayed in the chart above and include:

<sup>25</sup> Manufacturing Skills Australia, National Workforce Development Fund commencement data (unpublished). Accessed 20 May 2016.

### ***Aircraft Surface Finishing***

This is a niche trade qualification and therefore there are low enrolment numbers across all certificates. Across the Certificates III and IV level qualifications this trade is on scope at five RTOs, including one enterprise RTO. In absolute terms the demand for skilled workers in this area is low. None the less, enrolments reflect a continuing industry need in this specialised skill area.

### ***Aircraft Life Support and Furnishing***

There were ten enrolments at the Certificate III level in 2014, and zero enrolments over the last five years at the Certificate IV level. Much like the Aircraft Surface Finishing qualifications, these are considered a niche trade and high enrolments not expected. They are on scope at five RTOs, including two private and one enterprise RTO, and one Defence RTO. Training enrolment statistics are not publicly available from Defence.

### ***Non-Destructive Testing***

Defence states that they are heavy users of the MEA Training Package across all qualifications, however Defence enrolment statistics are not publicly available. Qualifications in Non-Destructive Testing were developed to meet defence requirements. Publicly available data shows zero enrolments over the past five years and not on scope at any RTOs. However with defence enrolment figures being inaccessible we cannot assume that the qualifications in this specialist sector are not being used.

### ***Aeronautical Engineering and Avionic Engineering***

These Qualifications were moved from the MEM Metal and Engineering Training Package to MEA in early 2015, with MEA deemed a more appropriate Training Package as outcomes are heavily related to CASA and Defence requirements. As yet there are no RTOs with scope, and no enrolment data.

In the MEM Training Package, there were not discrete qualifications in Aeronautical Engineering and Avionic Engineering. Rather the relevant Units of Competency were located in the Diploma of Engineering – Technical and in the Advanced Diploma of Engineering. Therefore it is not possible to obtain data from NCVER on the number of students undertaking a speciality in these areas.

# Employment

## Employment outlook

The employment outlook for this industry is good given the expected growth in air travel in the Asia Pacific region – that is, if Australia takes advantage of the opportunities that will be presented.<sup>26</sup> Stakeholders however are concerned that the infrastructure needed to support these opportunities is currently inadequate and there appears to be no appetite to invest in upgrading or developing new infrastructure. One project that does present potential employment opportunities is the Badgerys Creek airport development with its proposed aerospace/aviation precinct. This proposal would see the development of an advanced aerospace manufacturing and training precinct that would support the development of a world class industry.

## Workforce supply-side challenges and opportunities

The shortage of aircraft maintenance engineers (AMEs) and licenced aircraft maintenance engineers (LAMEs) especially in the GA sector has been reported by stakeholders as a huge challenge for the sector. The workforce is ageing and changes to licencing requirements is resulting in many deciding to take early retirement rather than retrain. Initially the industry thought that with the offshoring of maintenance services by Qantas, workers from the large passenger aircraft sector would transfer to GA. However, this largely did not happen for a number of reasons:

- many older workers chose to retire
- work opportunities in the GA sector are predominately outside of the major cities and moving unattractive
- most did not have the skills and experience required to work on the smaller, older aircraft fleet in the GA sector and access to retraining opportunities were limited

The long awaited finalisation of the small aircraft licensing (SAL) requirements has been frustrating for operators in the GA sector. However, stakeholders all agree that the impending release of the SAL syllabus will present both significant opportunities and challenges for workforce development for the industry. The challenge will be for RTOs to meet training demand across a geographically dispersed workforce. This is compounded by the shortage of RTOs currently with scope to deliver the relevant qualifications. Public provision of training in the industry, especially in Melbourne and Sydney, has been significantly impacted by Qantas' workforce restructure which resulted in big reductions in training numbers. A recent search of providers with scope shows that, with the exception of the Royal Melbourne Institute of Technology (RMIT), all public providers with scope are located in regional areas.<sup>27</sup> These issues have been highlighted in the Aviation Policy 2016 released by The Australian Aviation Associations Forum (TAAAF)<sup>28</sup>.

Stakeholders also identified issues around the basic skills many new learners are bringing to the industry. There is a call for the introduction of pre-employment, general practical skills that would underpin both manufacturing and

<sup>26</sup> Hampson, I., Fraser, D., Junor, A., Gregson, S., 2015, The Future of Aircraft Maintenance in Australia: Workforce Capability, Aviation Safety and Industry Development University of New South Wales, Sydney  
<http://www.mskills.com.au/downloads/The%20Future%20of%20Aircraft%20Maintenance%20in%20Australia.pdf>

<sup>27</sup> Training.gov.au, April 2016

<sup>28</sup> The Australian Aviation Associations Forum, 2016, Aviation Policy 2016, <http://amroba.org.au/wp-content/uploads/2016/04/TAAAF-Aviation-Policy-2016.pdf>

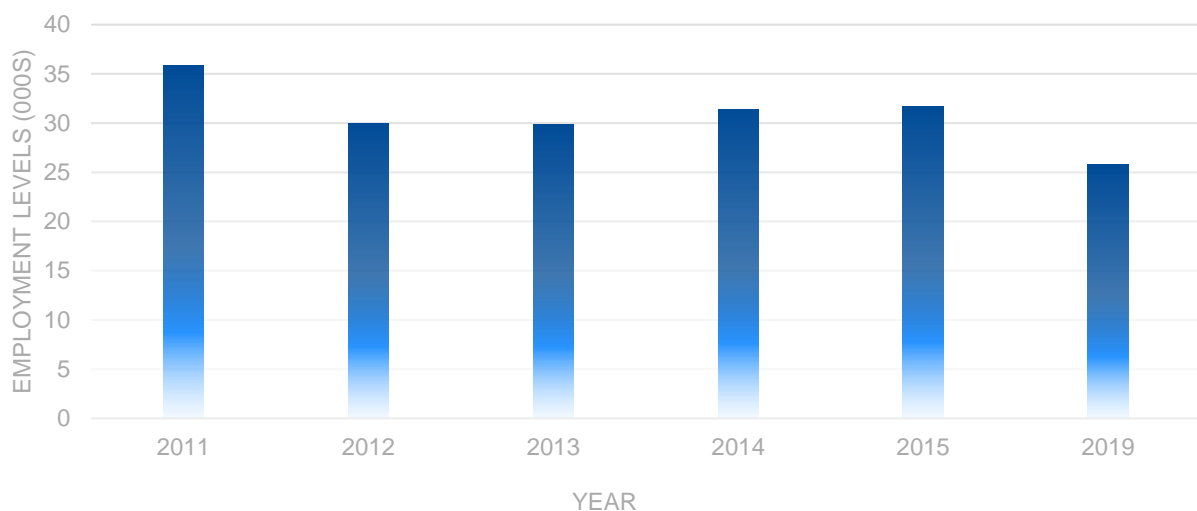
maintenance that could be implemented through the VET in Schools (VETiS) system. This could boost apprenticeship uptake in the industry.

The recent announcement of an increased number of Singaporean troops stationed in Rockhampton and Townsville will increase opportunities in these regions <sup>29</sup>. The defence bases and training facilities there are already well established and this extension will improve the bases and likely lead to expansion of the Australian facilities used by the Singaporeans.

### Additional information

The following graphs have been supplied by the Department of Education and Training. The Department has sourced national occupation-related data from the Department of Employment and the Australian Bureau of Statistics to inform the work of the IRCs.

### Other Transport Equipment – Employment Levels (000s)<sup>30</sup>



Source: Department of Employment Labour Market Information Portal

### IRC analysis

ANZIC Division level 239 'Other Transport Equipment Manufacturing' includes sectors outside the coverage of the MEA Training Package:

- Class 2391 Shipbuilding and Repair Services
- Class 2392 Boatbuilding and Repair Services
- Class 2393 Railway Rolling Stock Manufacturing and Repair Services
- Class 2394 Aircraft Manufacturing and Repair Services

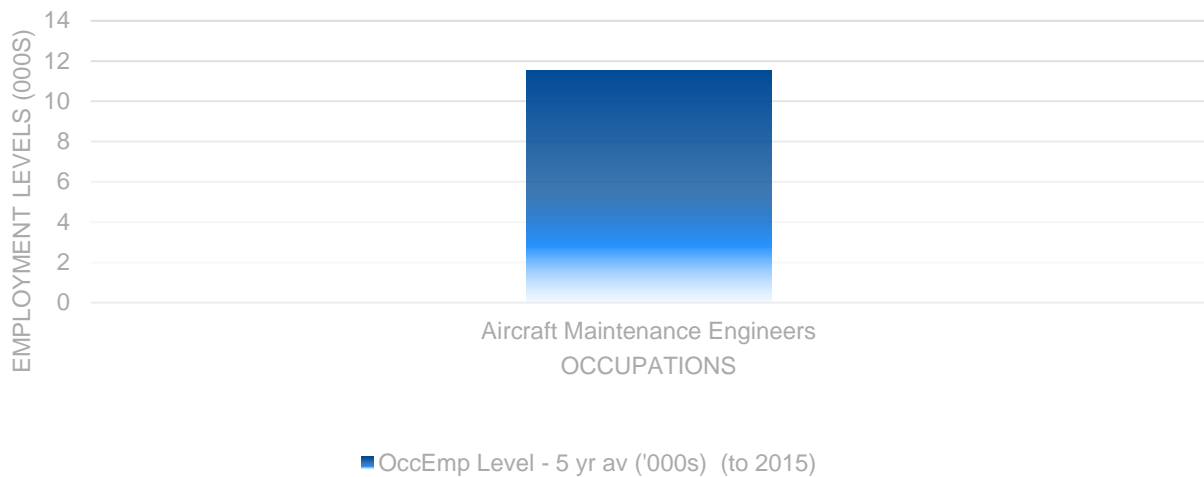
<sup>29</sup> Borrello, E, 2016. Singaporean army to sink \$2 billion into expanding Queensland bases, 14,000 troops on rotation, ABC News. <http://www.abc.net.au/news/2016-05-06/singapore-to-expand-queensland-defence-bases/7389168>

<sup>30</sup> Note: Figures are displayed at the ANZSIC Division level 239. The graph includes current and historical employment levels, as well as a projected employment level to 2019.

- Class 2399 Other Transport Equipment Manufacturing n.e.c

As such, projections of employment levels in the Aerospace sector may be skewed by changes in employment in other industries. A decline in employment for aircraft maintenance mechanics of over 8% is projected by the Department of Employment<sup>31</sup>. Stakeholders dispute this projection, citing the predicted growth in air travel in the Asia-Pacific region over the next five years for what they see as an employment opportunity.

### Key Occupations – Employment Levels (000s)



Source: Australian Bureau of Statistics (ABS)<sup>32</sup>

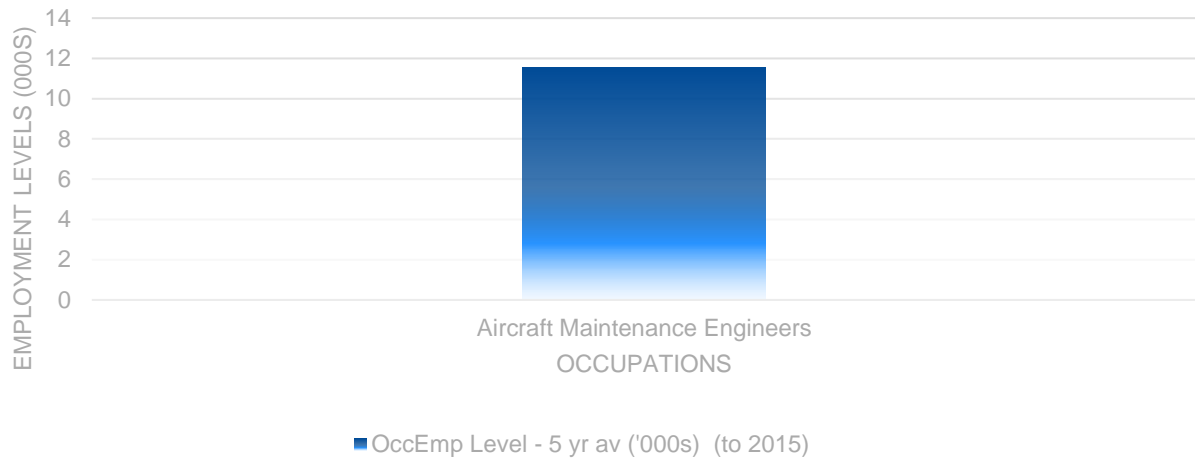
### IRC analysis

The first graph above, showing a five year annual average, does not give much scope for comment. Without seeing year on year changes, it can be difficult to comment on industry and economic influences that may cause fluctuations in employment.

<sup>31</sup> Department of Employment. 2016, 2016 Occupational Projections – five years to 2020, <http://lmip.gov.au/default.aspx?LMIP/EmploymentProjections>

<sup>32</sup> Note: Occupations are at the four digit ANZSCO code. Employment levels are the five year annual average to 2015. Figures include all employed in the occupation across the economy, not just the relevant industry.

## Key Occupations – Historical and Projected Employment Growth (%)<sup>33</sup>



Source: Historical employment growth from the Australian Bureau of Statistics (ABS) and projected employment growth from the Department of Employment.

### IRC analysis

It would seem that the second graph (page 21) may have been supplied in error, as it covers occupational employment levels, averaged out over a five year period, and does not provide projected growth.

By utilising data available on the Department of Employment's website, employment is projected to decrease by 8.5% for Aircraft Maintenance Engineers<sup>34</sup>.

<sup>33</sup> Note: Occupations are at the four digit ANZSCO code. The historical employment is the five year growth rate to 2015 and the projected employment growth rate is the expected growth rate to 2019. Rates are based on figures that include all employed in the occupation across the economy, not just the relevant industry.

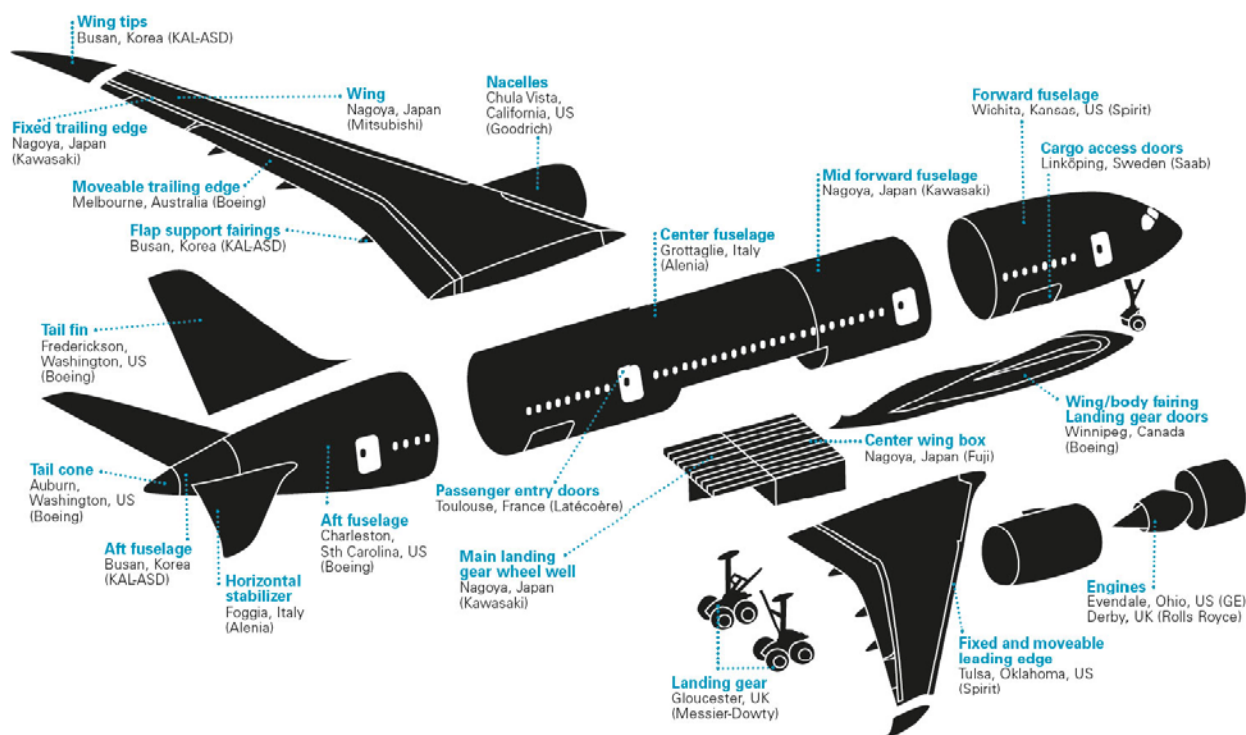
<sup>34</sup> Department of Employment, 2016. Labour Market Information Portal. Occupation projections. <http://lmip.gov.au/default.aspx?LMIP/EmploymentProjections>

## Skills outlook

### International and national trends

The Aerospace sector is an exciting industry and in many ways providing excellent examples of advanced manufacturing and through-life support services in Australia<sup>35</sup>. Quickstep are industry innovators with their patented out-of-autoclave processes, and scientists in Queensland are collaborating with Defence, Boeing and technology organisations from the USA in hypersonic flight development. Players in the Australian Aerospace sector are already showing an advanced research and development capacity and that they can be an integral part of the down-line global supply chains.

#### Example of a global value chain – manufacture and assembly of a Boeing 787 Dreamliner



Source: Department of Foreign Affairs and Trade, 2013, *Trade at a glance 2013*, pp. 24–25

There are many elements that stakeholders consider to be influencing workplace design and job design. Among the international trends that stakeholders identified is the introduction of new technologies, which are advancing rapidly. Digitisation, especially in new large passenger aircraft, is demanding workers with greater knowledge of and skills in working with computers. IT knowledge and the ability to analyse data are becoming intrinsic skills for technicians. With sophisticated on-board computer systems which monitor and report on the aircraft's 'health', remote operators need the skills to analyse and correlate the data to ensure that maintenance and repair activities are undertaken in a timely manner. Similarly, the job design of aircraft maintenance engineers working on such aircraft is changing to

<sup>35</sup> Australian Aviation, 2016. RAAF, BAE Systems mark 100,000 Hawk flying hours, Australian Aviation, May 2016 <http://australianaviation.com.au/2016/05/raaf-bae-systems-mark-100000-hawk-flying-hours/>

meet these requirements. Development of these IT and electronic skills is considered a priority and deemed to impact significantly on job and workplace design.

The increasing use of robotics is a trend impacting on the whole Aerospace sector. Internationally, robotics are now part of the manufacturing process, requiring technicians with not only manufacturing skills, but also digital programming and problem solving skills<sup>36</sup>. This skill need will also apply to the use of RPAS, with the growth of this technology being seen both in Australia and internationally<sup>37</sup>. CASA already is predicting a growth of between 200 and 500% in this sector by 2020.<sup>38</sup> RPAS are already being used in Queensland to inspect gas wells, pipelines and processing facilities where inspections were previously conducted by operations staff either on the ground or in piloted aircraft. The company providing the service, a Boeing subsidiary, have been providing RPAS services to Defence, civil and for commercial interests in the Asia Pacific region since June 2009<sup>39</sup>. Stakeholders expect that within the next 10 to 20 years, the advent of pilotless transport and passenger aircraft will also significantly change IT support and maintenance activities and therefore the skills needed by maintenance engineers.

While stakeholders from the Australian Defence Force (ADF) agree with much of the above, they also identified other trends that will impact workplace and job design. These include complex multi-skills systems, ADF aircraft fleet requirements for through-life support and logistics support analysis. The ADF is currently investigating a specialist technician's strand which would provide a pathway from surface finishing or structures job roles.

## Sector skill needs

The five most important skills for the sectors workforce within the next three to five years.

Rank	Skill	How identified
1	Information technology	Industry consultations
2	Electronic	Industry consultations
3	Digital programming	Industry consultations
4	Through-life support	Industry consultations
5	Logistics support analysis	Industry consultations

<sup>36</sup> Condliffe, J. 2016, Inside the workshop that builds the world's largest wings. Gizmodo, Australia. <http://www.gizmodo.com.au/2016/05/inside-the-workshop-you-need-to-build-the-worlds-largest-composite-wings/>

<sup>37</sup> My Sunshine Coast, 2016, Advance Queensland funding to advance remotely piloted aircraft tech in Queensland, <http://mysunshinecoast.com.au/news/news-display/advance-queensland-funding-to-advance-remotely-piloted-aircraft-tech-in-queensland,44856>

<sup>38</sup> Aviation Business, 2016, CASA issues 500th UAV operator certificate. <http://www.aviationbusiness.com.au/news/casa-issues-500th-uav-operator-certificate>

<sup>39</sup> Aviation Business, 2016, Queensland Gas contracts RPAS for pipeline inspection. <http://www.aviationbusiness.com.au/news/queensland-gas-contracts-rpas-for-pipeline-inspection>



## Generic workforce skills

Ranked from 1 being the most important to 12 being the least important.

1	Technology
2	LLN
3	STEM
4	Communication / Virtual collaboration / Social intelligence
5	Data analysis
6	Learning agility / Information literacy / Intellectual autonomy and self-management
7	Managerial / Leadership
8	Design mindset / Thinking critically / System thinking / Solving problems
9	Environmental and Sustainability
10	Customer service / Marketing
11	Entrepreneurial
12	Financial

## Other relevant skills-related insights for this sector

According to stakeholders the trend in Europe and North America is for multi-skilled workers. A similar trend is developing here with stakeholders increasingly demanding that regulations and the corresponding training be able to allow workers to move between sectors. The Australian workforce also needs to be able to work to international standards as the industry competes in an increasingly global regulatory environment.

At the same time some differences may be seen between the large passenger aircraft sector and the GA sector in the skills needed by the industry. In GA, skills and knowledge in through-life support for smaller and often older aircraft are required. An aircraft engineer in the GA sector needs to be able to work on a wide range of aircraft, including perhaps rotary wing as well as fixed wing. The sector also faces the challenges of an ageing workforce, compounded by recruitment and retention issues, which is particularly critical in regional and remote locations.

Technicians are also adapting to learn the skills needed to work with new, more technical, composite materials as well as low observable coatings in military aerospace. All are driving an increased need for workers with the skills to use these materials in both the manufacturing and maintenance sectors.

There is also an increasing interest in the development of bio-fuels for the aviation industry. Virgin Australia and Air New Zealand recently issued a 'request for information' to explore the possibility of procuring aviation bio-fuels locally.<sup>40</sup> The potential skills impact of the use of these fuels is yet to be established.

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<sup>40</sup> eGlobal, 2016, Air NZ and Virgin Australia launch search for aviation biofuel opportunities, March 15, 2016, <http://www.eglobaltravellmedia.com.au/air-nz-and-virgin-australia-launch-search-for-aviation-biofuel-opportunities/>

## Training Product Review Plan 2017-2021

In September 2016, the majority of stakeholders reported that the current Training Products (MEA Version 1.3) met their needs. Consultation with the Aerospace Education and Training Committee IRC and State Training Authorities in March and April 2017 identified a number of priorities for training product review and development.

The IRC Skills Forecast and Proposed Schedule of Work 2017-18 to 2020-2021 table provided at the end of this document lists the priorities for the next four years. This table also provides the rationale for these priorities, the proposed scope and timeframes for these activities.

### Items identified as time critical and to be included in the priorities for 2017-18

The items identified as critical and proposed for inclusion as a priority for the 2017-2018 schedule of work are:

- evaluate compliance of Training Products with International Civil Aviation Organization (ICAO) skill standards, and
- evaluate adequacy of skills for support systems.

### Additional factors for consideration

In September 2016, some stakeholders raised the following concerns and suggestions:

- the current structure of the MEA Training Package and Units of Competency are causing problems with delivery, leading to unintended consequences and difficulties
- a need for the trade skill training to be separated from the additional knowledge required to obtain a licence
- trade training must take into consideration the skills and mind set of secondary school leavers, who often present with higher levels of IT skills and lower practical skills than that of past generations

The IRC acknowledges the need to continue to work with CASA and industry stakeholders as the regulatory framework continues to evolve and mature to ensure that the Training Package meets the needs of the industry.

## IRC Signoff

This IRC Skills Forecast and Proposed Schedule of Work was agreed as the result of a properly constituted IRC decision and was approved by the Chair, Russell Burgess in April 2017.