



The Future of Aircraft Maintenance & Manufacturing in Australia

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The Future of Aircraft Maintenance & Manufacturing in Australia

Building sovereign capability
and realising export potential



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Senior Deputy Dean
Leisa Sargent





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IRRC Director
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Opportunities and Challenges for Aircraft Maintenance and Manufacturing in Australia

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Associate Professor
Ian Hampson



Introduction

- Air of crisis in the industry ... But
- Australia now has a unique opportunity to build and rebuild its aircraft maintenance and manufacturing industry
- Australia is highly dependent on aviation; it cannot let the maintenance sector slide
- There is currently a fortuitous convergence of reform agendas and policy imperatives > reform possibilities
 - Defence Industry Policy
 - ‘Harmonisation’ and Defence Regulatory Initiative (RRI)
 - Training (VET) reform
 - Post-implementation CASR part 66 review

1. The Looming Skills Shortage: What Follows?

- Asian Region will be particularly hard hit
 - Possibly more difficult to gain berths offshore
 - Possible decline in quality and safety placing extra demands on safety oversight
- Our training sector, like others, has not kept up
 - Fall in throughput; concerns about quality
- Challenges for Training
 - The national training system (outside aviation) is ‘in crisis’ and in need of reform – momentum for change!

Training and Licensing

- Difficult interactions between training and licensing
 - CASR (part 66) raised 'B' license qualification to Diploma (from CIV)
 - Funding arrangements state-by-state and varied; most would not fund difference CIV to Diploma
 - Two sets of regulations (CASA/ASQA) are not always consistent; sometimes tricky workarounds
 - Small Aircraft Licensing (GA) not resolved after 9 years
 - Australian licenses and qualifications difficulties with overseas recognition post-CASR part 66 (2011)

2. What are the relevant 'International Standards'?

- ICAO scores Australia highly (85%) for 'implementation' of 'licensing' (Annex One) – why then the problem with international recognition?
- EASA – most *directly* relevant standards (part 66)
 - Syllabus – specifies modules and topics which have to be turned into training programs > fragmentation across pt 147 category MTOs
 - Difficulties aligning EASA modules to competency-based qualifications
- Reference point = ICAO Training Manual
 - Hard to map to EASA syllabus – need to be done by experts, at ATA chapter level
 - Training Manual may be losing ground as central reference point eg IATA/ICAO NGAP program



Suggested 'National' Approach

- Develop a centralised curriculum and exam materials
- Rethink relation between EASA syllabus and training packages/ competency standards
 - (as is happening in Britain)
- National Aviation College?
- Possibility of expanding Australia's Training Export industry

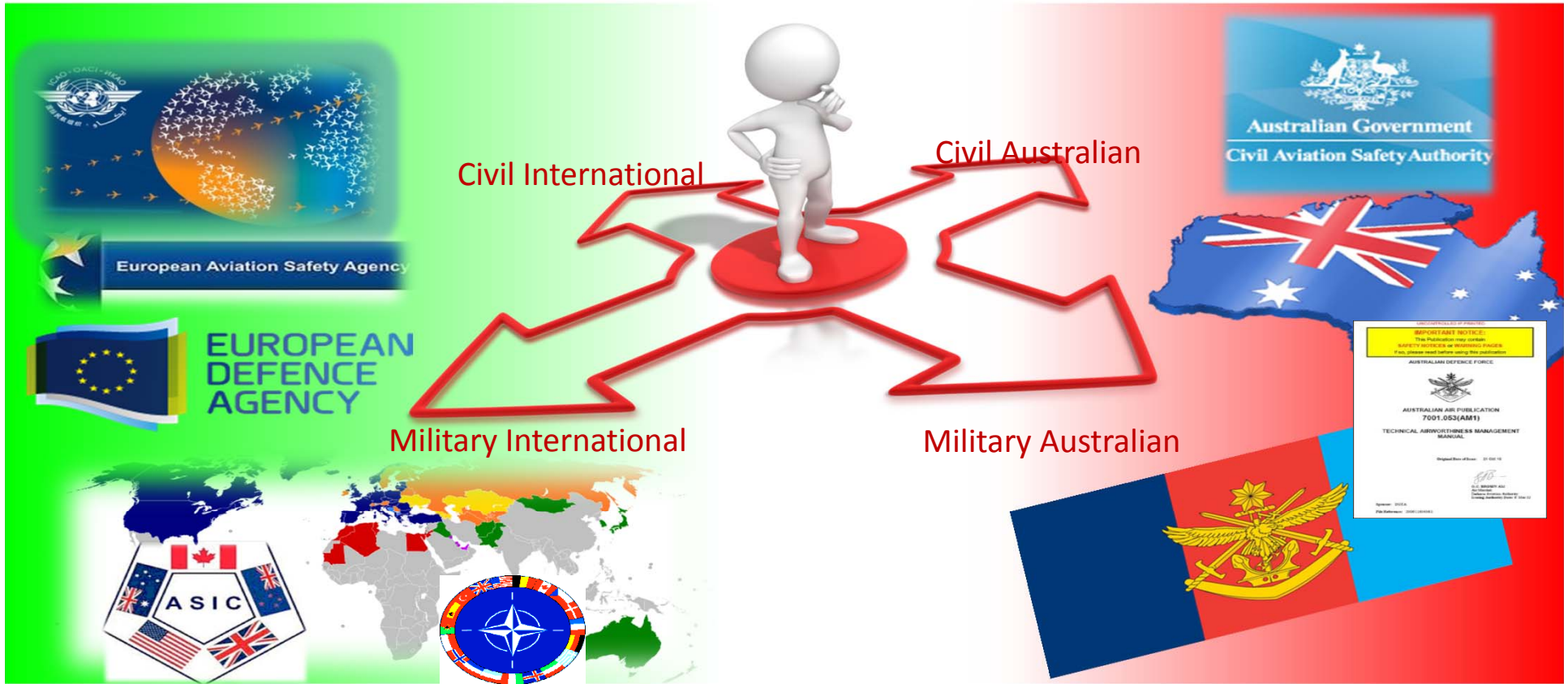
3. 'Harmonisation' and Defence Industry Policy

- Defence Regulation Reform Initiative (RRI) – new DASRs (part M; 66; 145; 147)
 - Emphasis on 'sovereign industrial capability' and 'inter-operability'
- 'Harmonisation' of certification arrangements and qualifications across Defence and civilian sectors
 - Civil governed by ICAO; Defence aviation regulation is 'bespoke' – need to align
 - Differences between civil and Defence re certification arrangements, qualifications and training
 - 'Training Gap'? – Defence AMEs qualified to CIII-IV; EASA/CASR pt 66 standard is Diploma

‘Harmonisation’ – 3 Faces

1. Of qualifications, training and ‘licensing’ across Defence and civilian aircraft maintenance within Australia
2. Of Australian qualifications and licenses with overseas military (and civilian) via EMARs
 - Allow ‘interoperability’ between Australian and overseas military aviation
3. Of Australian qualifications and licenses with ‘international standards’





Conclusion

- An unusual confluence of circumstances – fluidity and possibility
 - Reviews and reform in Training sector
 - CASA review of part 66
 - Defence and international Imperatives towards ‘harmonisation’
 - General Aviation licensing
- Now could be the time to reform the sector – need for the sector to develop a ‘voice’
- Research possibilities ...



The Changing World of Regulatory Oversight: Opportunities and Threats

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Professor
Michael Quinlan



Introduction

- Initial research focus on safety and regulatory oversight of offshored heavy maintenance
- International safety oversight and regulatory system in need of clarification
- International mechanisms (ICAO system) of safety oversight are bound up with certification of aviation manufactured products
- Essential role for government and the regulator in seeking approvals for manufactured exports on behalf of enterprises

1. Offshoring and Safety

- Recent (past few decades) changes in the industry – growth of third party MRO – challenges to regulatory oversight
- Similarities to other industries
 - Risk factors associated with outsourcing and offshoring
 - Geographic spread
 - Major changes in safety oversight
 - Shift from direct inspection to process audits and demands on inspectorate
- Accounts of some poor quality practices in some overseas MROs, usually associated with poor regulation

Risk Factors in Other Industries

- Pressure
- Disorganisation
- Regulatory Failure
- ‘Paper Compliance’
- Dependence on skills of auditors
- American debate about offshoring and safety
 - risk factors appeared in analysis of crashes
 - Congress pressured FAA to increase regulatory oversight



What works?

Lessons on Minimising Risks/Maximising Benefits

- Strategic decisions on what and when to outsource
- Careful selection of supplier (MRO)
- Building long-term relationship between airline and MRO based on commitments to quality, safety, timelines, two-way communication, worker involvement and trust
- Ensuring system oversight targets known risk factors & involves direct observation of processes not just paper compliance
- Establishing strong reporting culture and careful balance of routine/contingency
- Periodic auditing to ensure system remains robust & changes/deficiencies are addressed

2. International Safety Oversight: The ICAO system

- Not transparent, contains regulatory tangles and blind spots, and is changing
- Fundamentals of ICAO system:
 - National sovereignty
 - National regulator responsible for safety of 'its' planes (Annex 8)
 - State of registry has to accept oversight by another state provided it meets 'international standards' (Article 33)
 - States have to seek standardisation (Article 37) or file differences (Article 38)
- BUT: How does a national regulator know about practices in other countries, and whether they meet international standards?

Trust – But Verify!

- 1998 Universal Safety Oversight Audit Program (USOAP) set up to audit national regulators (visits by arrangement) & issue ratings.
- Audits revealed fundamental weaknesses in safety programs in many states and significant differences in global safety standards (ICAO 2008)
- Auditing then shifted to ‘continuous monitoring’ (CMA) – more use of ‘self-report’ paperwork.
- Australia – expectation that compliance for training and licensing would be low – but it’s 85%
- And what is happening in other countries?
 - = Questions for research

Trust – But Verify!

- 2013 ICAO Safety Report average compliance level implementing “critical elements” of safety oversight only 61% across 96% of member states
- ‘level of implementation’ is a significant shift in language, from ‘compliant – or not’
- Some nations have very low ‘levels of implementation’
- There are multiple actors in the international regulatory space – FAA, EASA, IATA
- Also UAE CAA proposal for MORC – regulator to approve AMO on recommendation from Air Operator
- Our preference is to strengthen the international agency and keep auditing work in the public sphere

3. Opportunities and Imperatives

- Challenges for CASA
 - Last ICAO Audit, and Aviation Safety Regulation Review > better training for inspectors and auditors
- Facilitate approvals for Australian aerospace manufactured goods, possibly through intergovernmental agreements
- Build regulator capacity for independent safety oversight role in accordance with Annex 8 responsibilities

Lessons of AirAsia 8501

- Dec 2014 crash – interaction of persistent maintenance fault and poor pilot training
- Indonesia (NAA of AirAsia) one of ICAO ‘least compliant’ nations, and poor safety record
- FAA banned all Indonesian airlines from US
- EASA allowed Garuda, but not the rest, into Europe
- Australia allowed AirAsia Indonesia access – difference between Australian standards and other agencies?

Conclusions



- Need to rebuild CASA – more resources
- Potential career paths and training opportunities within CASA
 - Inspectors and auditors
 - Those with responsibility for international regulation
- Propose research into international regulatory system and Australia's position within it.

Response: Mike Higgins

Has served on the CASA Maintenance Standards
Sub-committee

CEO and Company Secretary Regional Aviation
Association of Australia





The International Crisis in Aircraft Maintenance Skills

What it means for Australia

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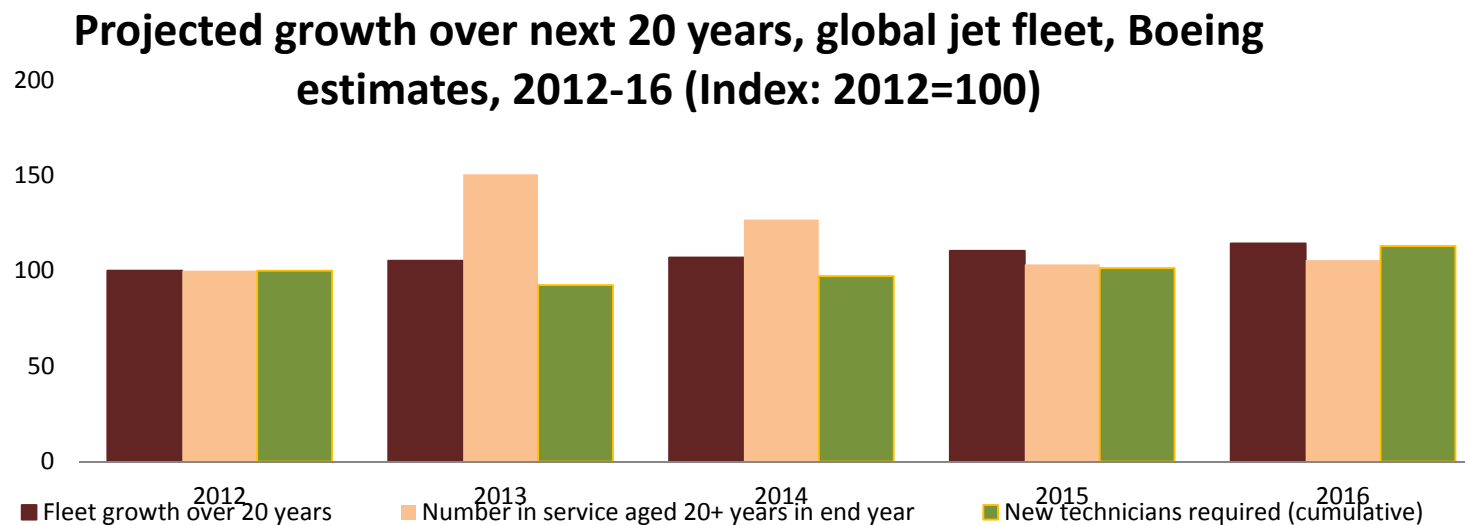
Doug Fraser
Independent Evaluation Consultant



Global Dimensions of the Crisis

- Authoritative estimates of the global need for aircraft maintenance technicians range between 500,000 and 800,000 by the early 2030s
 - All these estimates exclude defence and most GA
- Asia-Pacific expected to have the greatest requirement (overall and unmet)
- Shortage expected to peak in early 2020s

The spread of less maintenance-intensive technology will not reduce the aggregate demand for skilled labour



Boeing's forecast labour requirements were *lowest* for the year (2032) when older technologies were predicted to be most common

How is the crisis affecting Australia?

- Basic problem: we don't know how many AMEs there are in Australia today
 - We won't know until the 2016 Census results have been released
- We estimate - very tentatively – that the number of fully qualified AMEs still working in the occupation (including Defence) has fallen from 15k in 2011 to around 13,500
- Using these calculations, we estimated the available civilian workforce in 2013 at 70% of the ICAO benchmark for a fleet (including GA) of this size and configuration

Suggested factors behind the shortage

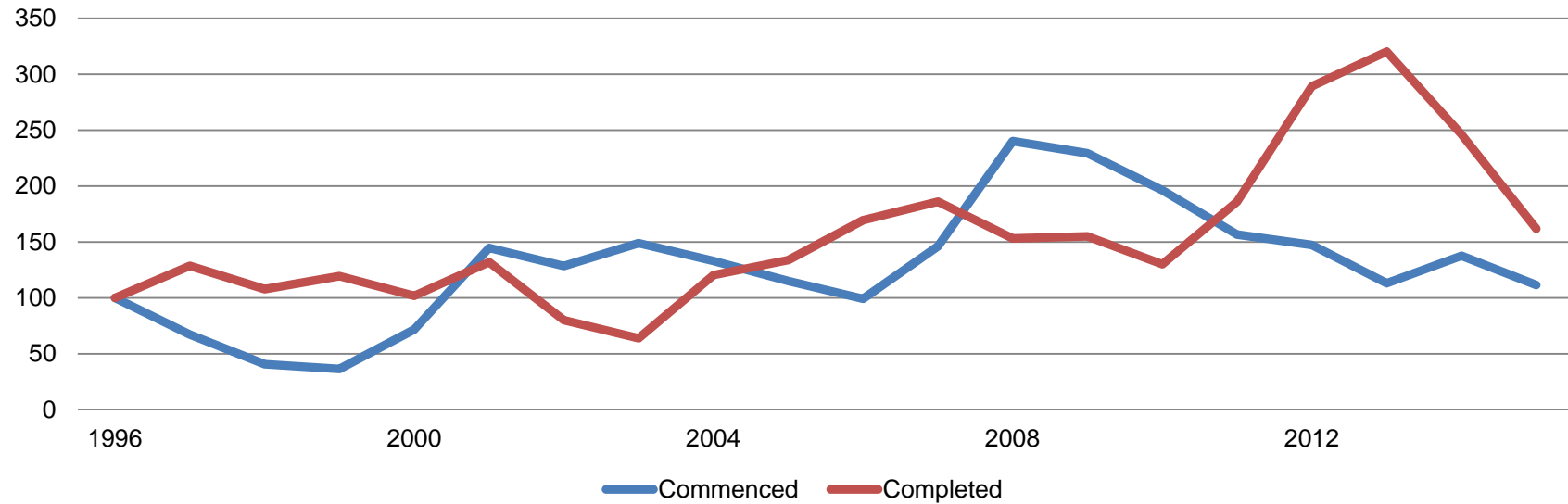
- Growth of the global fleet has outstripped growth in the training infrastructure
 - Strongest in those regions where that infrastructure is least developed
- Increasing dominance of LCCs with limited commitment to (or capacity for) workforce development
- Generational change as existing fully-skilled workforce reaches retirement age
- Reduced willingness of many western governments to support technical education
 - Misplaced reliance on market-driven solutions

Other likely factors specific to Australia

- Generational turnover brought forward by
 - QANTAS and JHAS layoffs
 - licence exclusions and the cost of removing them
- Retention and recruitment adversely affected by
 - declining attractiveness of the occupation
 - competition for the same types of skill from better-paying industries and overseas MROs
 - individuals needing to pay most/all of the cost of initial training
 - shrinking availability of satisfactory training options
- Offshoring has temporarily reduced the incentive for the major carriers to address their own future skill needs
- The small aeroplane sector continues to have difficulty filling highly specific skilled vacancies

Apprenticeship activity remains at or above historic levels, but is declining fast

Key AME apprenticeship indicators, Australia, 20 years to 2015 (index: 1996=100)

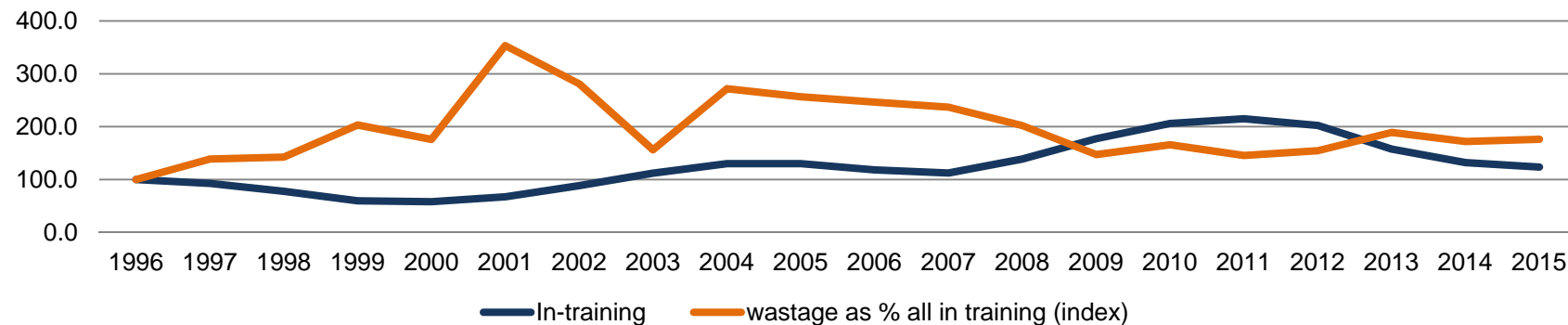


Generational change in the skills base

- The new generation of aircraft technology entails new types of competence (predictive maintenance, big data analysis, all-composite airframes, NDT)
 - Few Australian AMEs have had the chance to acquire these skills
- At the same time, a need will remain for the skills to inspect/repair existing-technology aircraft
 - Current- or past-generation aircraft will still make up half the world commercial fleet in 2025
 - As these planes age, they will demand a higher level of those skills
- The next generation of AMEs will need to be skilled in both areas
 - Pressure of demand on the available workforce may limit the opportunities for specialisation
 - GA is likely to see a parallel (but lengthier) technological transformation over this period
- This unprecedentedly broad scope of required knowledge will mean increased training time, effort and cost

Wastage (e.g. from retrenchments, dropouts and failure) remains a concern

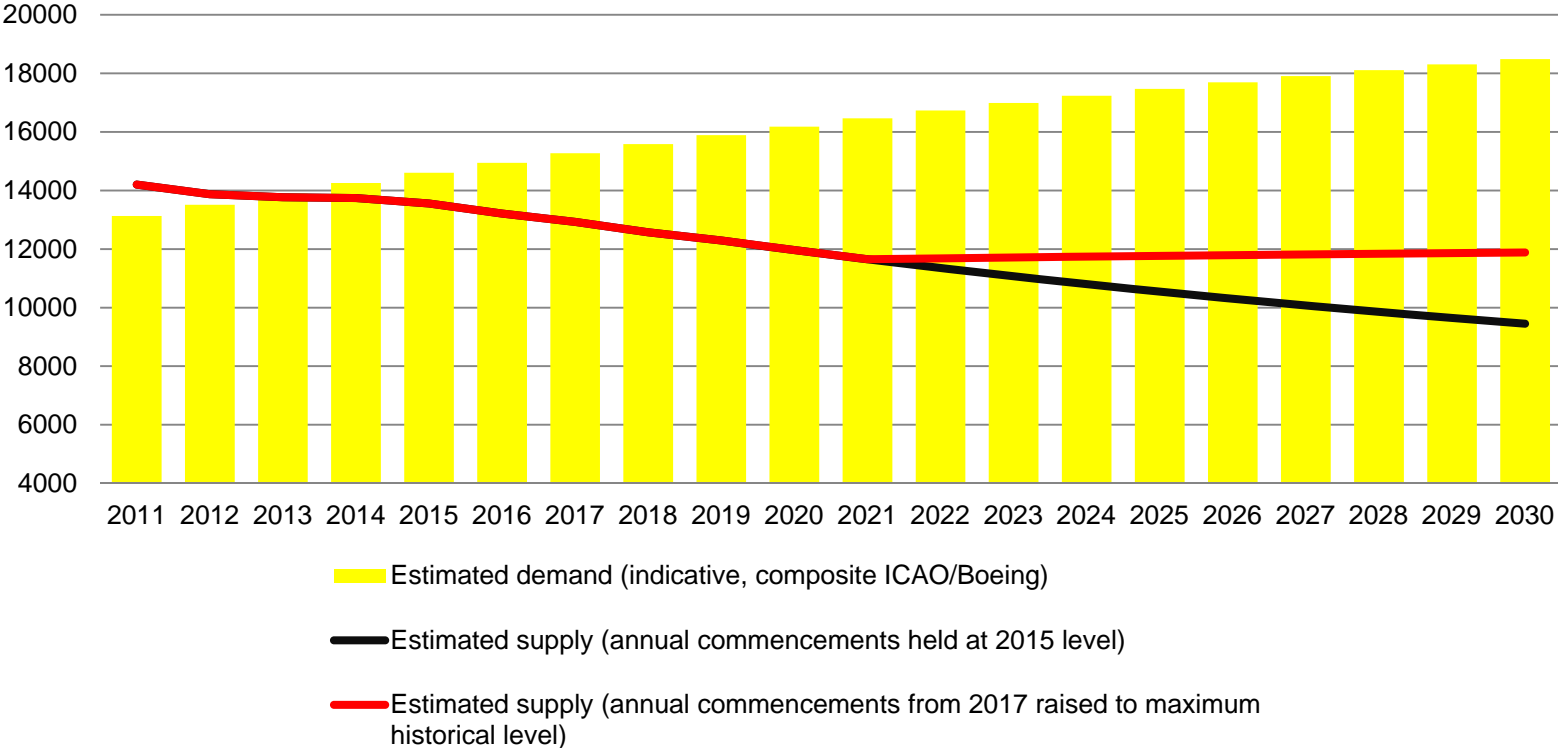
Numbers in training (index: 1996=100), and wastage as %, 20 years to 2015



- Wastage peaked, and numbers tanked, around the time of the Ansett collapse
- Further peak in wastage around 2004-5, tailing off until 2013
- Wastage over the 20 years averaged 10.46%
 - Rate over last 5 years has been slightly below average, but remains important given the diminishing numbers in training
- On-time completion rate rose in last 2 years, but still well below historic levels

At current levels of recruitment,
labour supply will fall well below
replacement level

Active AME labour force, Australia, 2011-2030 (end of year, assuming 5% annual attrition)





Industry and Workforce Prospects

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Hon. Associate Professor
Anne Junor

Jane Newton
Manufacturing Skills Australia



Need: Sovereign industrial capability and security

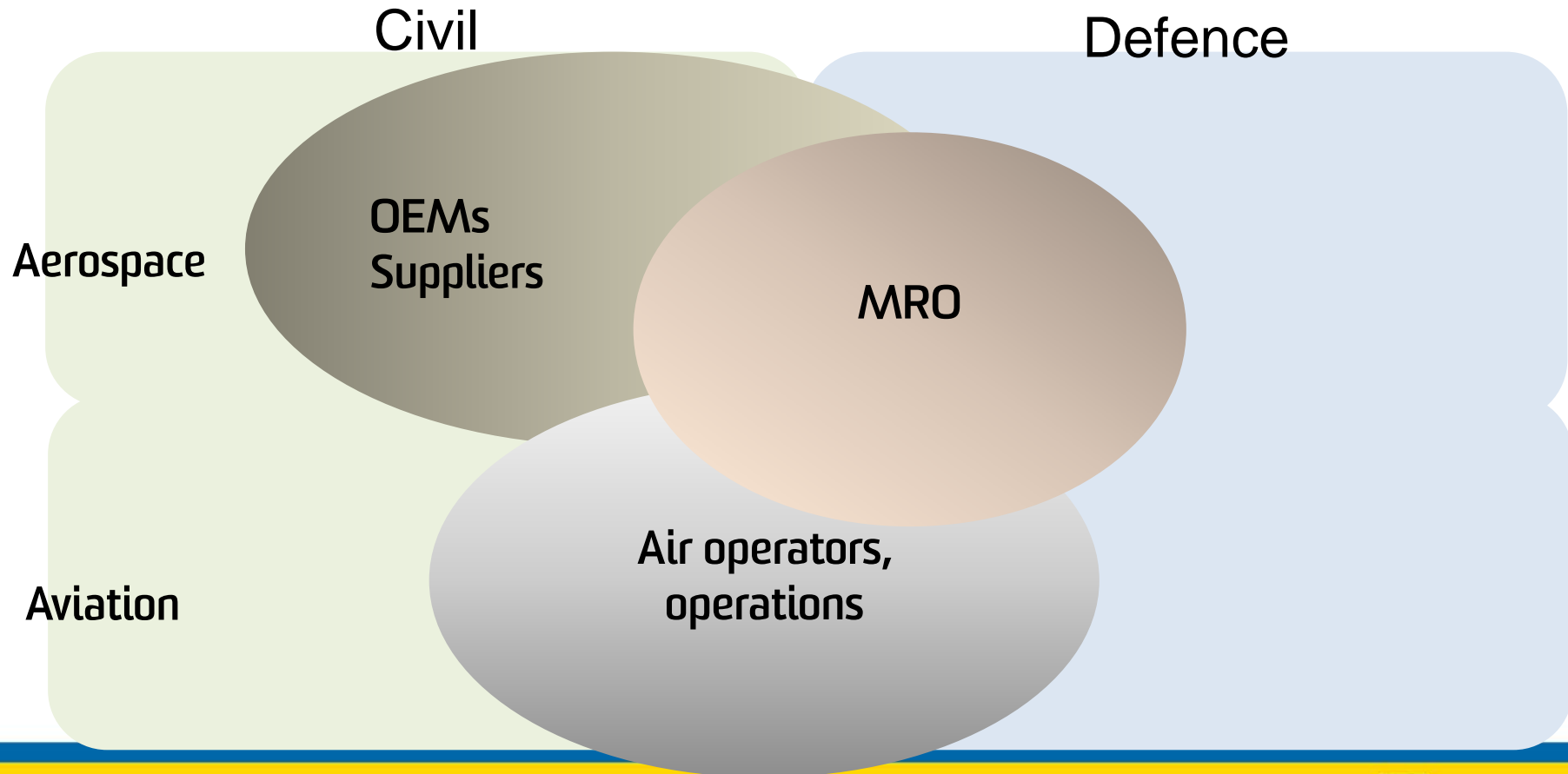
Potential: Global integration and export capacity

Pathway within and across sectors:

- Linking strategy - capability - resourcing
- Innovation, renovation
- Workforce development and new career paths

Will require: Policy coordination and industry voice

2 Industry: Global, National, Regional, Local ...



3 Civil – Demand

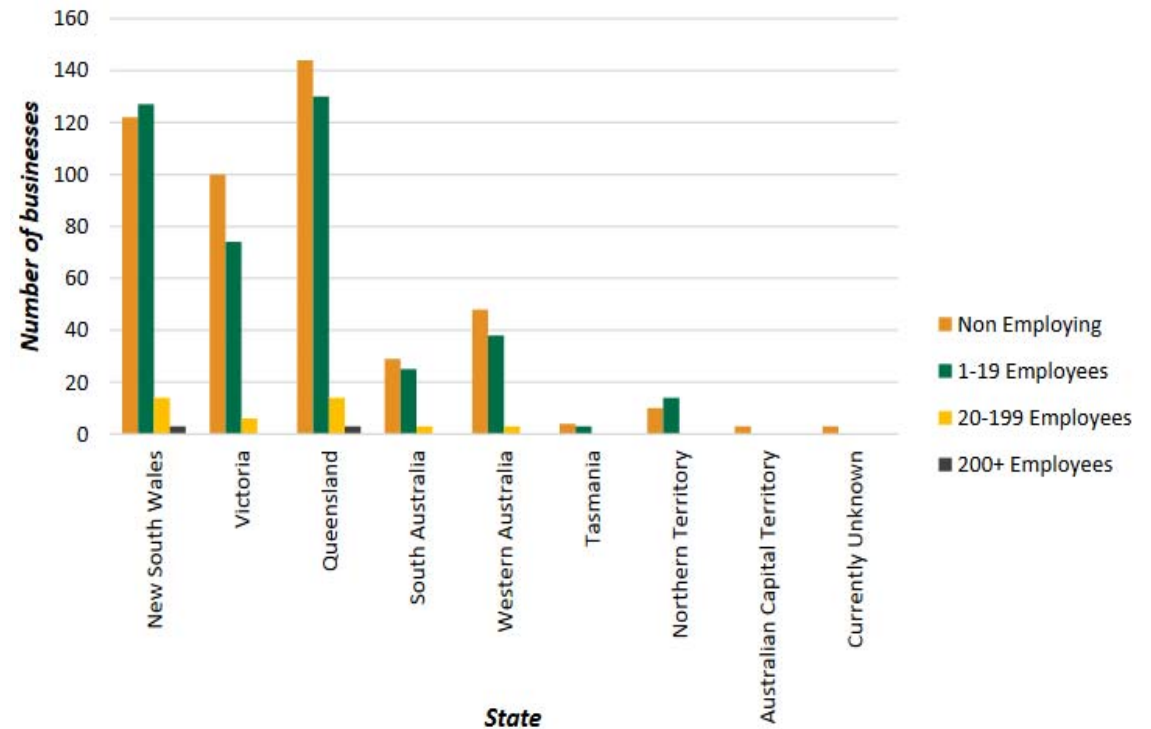
Aircraft on CASA register Aug 2015	No. in Category	Aged <5 years	
		No.	%
>100,000kg MTOW	85	31	36%
50,001–100,000kg MTOW	275	116	42%
20,001–50,000kg MTOW	174	30	17%
5,701–20,000 MTOW	432	37	9%
GA 2-engine turbofan/turboprop	276	27	10%
GA 2-engine piston/diesel	1237	37	3%
GA 1-engine turboprop	335	50	15%
GA 1-engine piston	8657	472	5%
Rotorcraft	2135	361	17%
Total	13603	1161	9%

Source: CASA 2015

4 Civil - Supply

Australia-based, undertaking maintenance , 2014	No.
Aust Main Route RPT/Freight	9
Regional RPT	16
GA Air Operator	116
Defence contractor	67
Aust independent 3rd Party MRO	84
GA MRO	262
OEM	21
Education/Training (Flight, Mntce)	47
Aviation Services	115
Aerospace Manufacturer	122
Professional Services	66
Supply chain - MSA est. (30% MRO-linked)	1019

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



Sources: AMROBA 2015; AIU 2014; Aust Defence Magazine 2014; ANZ Defence Directory 2014; Aviation WA 2013; CASA 2015; Aviation-Aerospace Aust, 2015; IS-BAH 2014; SADIG 2014

Source: MSA 2016 (ABS 2015)



5 Supply – Growth Opportunities

Business	CAMO	AMO	Cat MTO	Type MTO	S 21M
Overseas airline	4	11		1	
Australian airline/freight	7	4		2	
Regional air line	17	15		1	
GA air operator	3	3			
Australian 3rd party MRO	7	51		2	6
Australian GA MRO		17			1
Overseas MRO	2	31		1	
Contractor – Civilian/Defence	1	4		2	2
OEM		17		14	
Australian manufacturer		7			
Aviation services - Logistics/parts		2			
Australian RTO			4	2	
Other Australian based training				4	
Offshore training organisation				9	
Professional/engineering services		3			21
Total	41	165	4	36	34

Source: CASA 2015,2016)

6. Defence White Paper & Industry Policy Statement

Strategy – Capability – Resources

- Integrated investment - acquisitions + enabling workforce
- 10 yr budget - \$30b – 2%GDP
- F-35A Lightning II (JSF), E/A-18G Growler, F/A-18 Super Hornet, Wedgetail, air-to-air refuelling, transport plane upgrades
- Upgrade bases, logistics, training, testing, ICT
- Contracting; Industry collaboration in innovation

Indo-Pacific Region to 2035

- **Rising living standards**
- **Half world's econ. activity**
- **Technology modernisation**

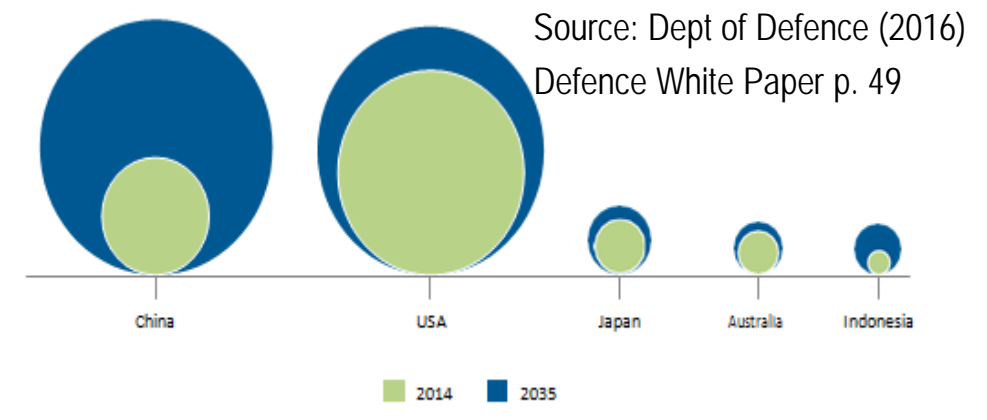


Figure 1: Indicative Defence Spending to 2035

7. Paths to Industry & Workforce Development

Governments: coordinated strategy

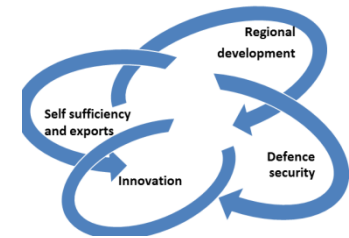
- Trade support
- National/state government coordination
- Defence/civil alignment/harmonisation
- Regulation: Improved role in international safety oversight system
- International transferability; qualification and license recognition; product approval

Education/training

- Apprenticeships; utilise current knowledge and skills base
- Continual skills upgrading via upgrading of qualifications and licensing
- Cross-sectoral career paths and aerospace/aviation pathways

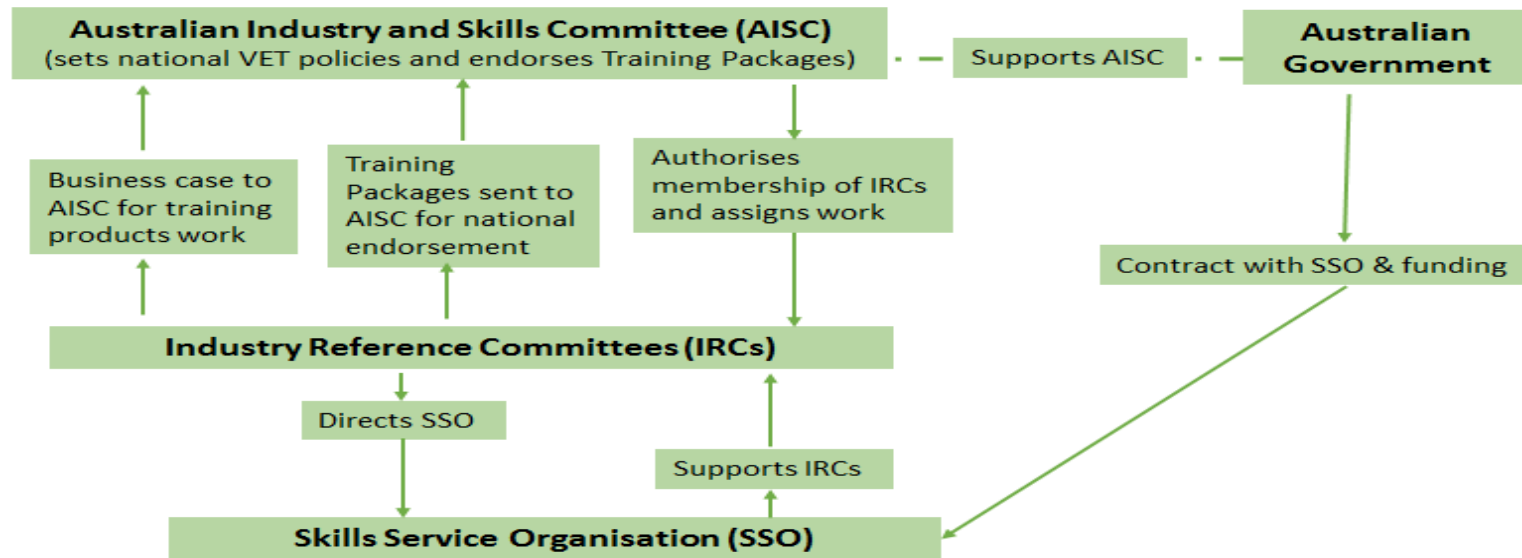
Innovation/Renovation

- Aircraft Mfg/Maintenance advocacy, clearing house - all existing industry associations
- Precincts/networks (eg Qld Roadmap, Badgerys Ck, NASP Vic)



8. Manufacturing/Aero – Skill Development

Skills Service Organisation (SSO) model



9. Aeroskills career pathways in VET

Areas of employment in the aeroskills sector include:

Aircraft maintenance engineering

Aircraft maintenance engineer (avionics)
Aircraft maintenance engineer (mechanical)
Aircraft maintenance engineer (structures)

Aeroskills specialisations

Licensed aircraft maintenance engineer (LAME)
Aeronautical engineer
Aircraft maintenance manager

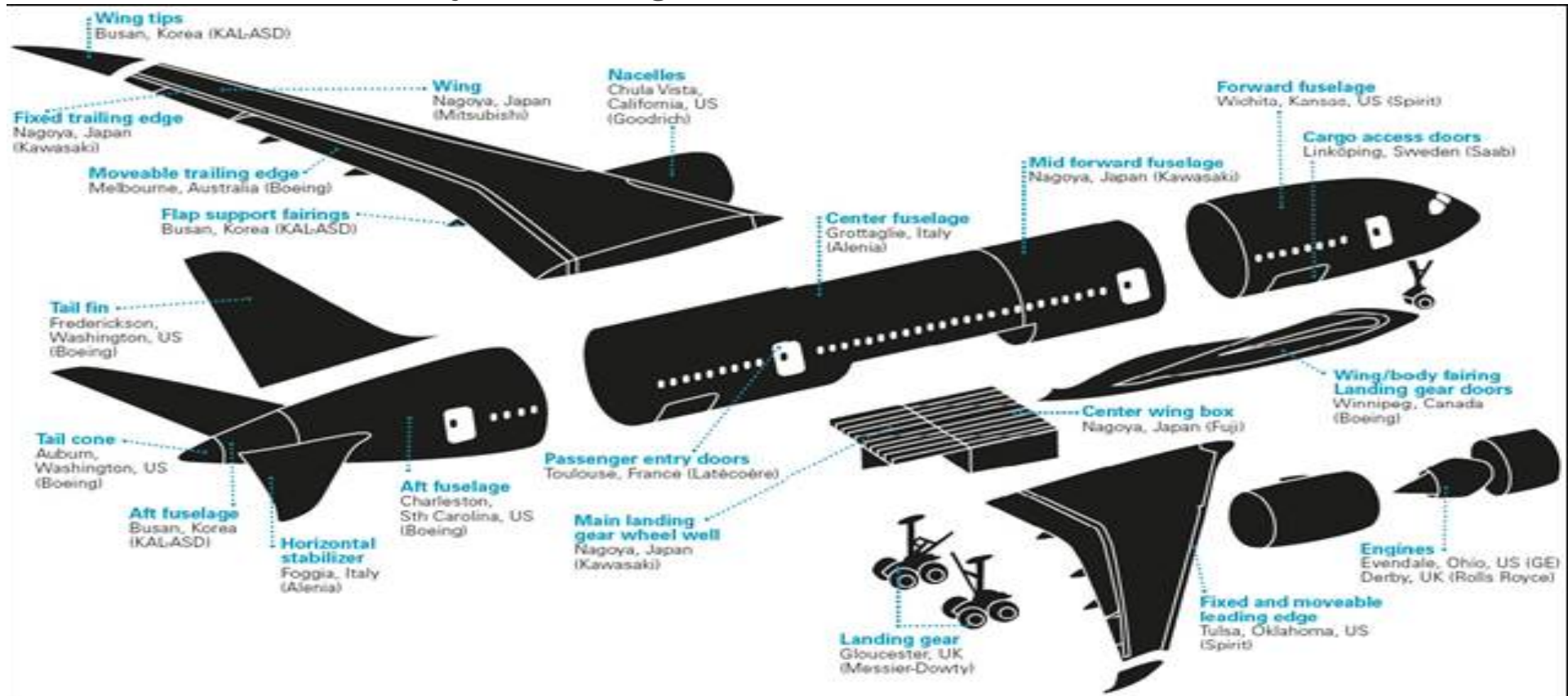
Aircraft maintenance

Aircraft surface finisher



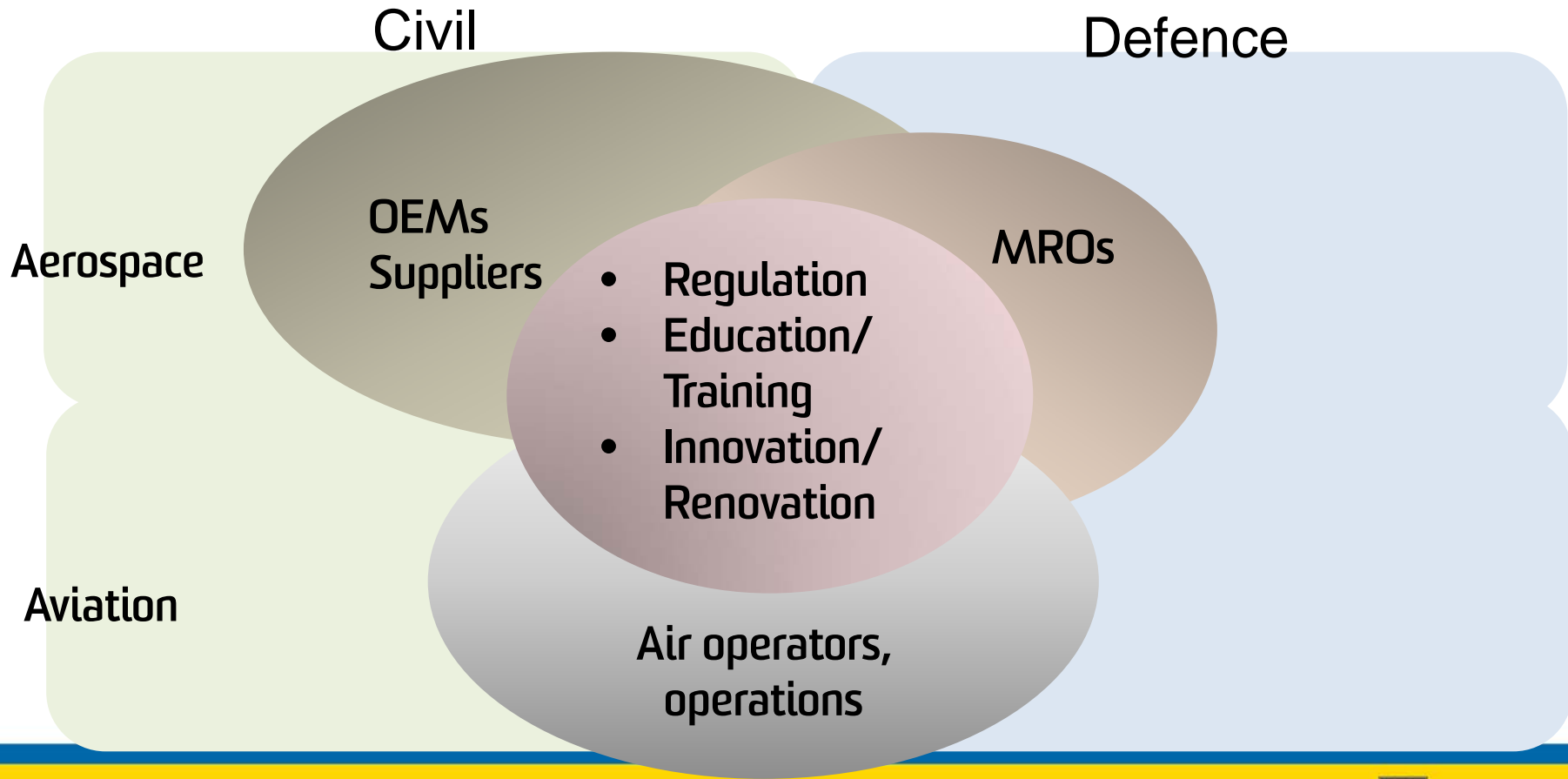
10. Locating Australia in a Global Value Chain? Example

Manufacture and assembly of a Boeing 787 Dreamliner



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

11. Strategy ...Capability ... Resources



Response: Jon Bradshaw

Manufacturing engineer

Chair Skills and Executive Committee member
Sydney Aerospace and Defence Interest Group)

UNSW – Engineering and Manufacturing School.
Industry Advisory Network Industry

Reference Committee member NSW Parliamentary Friends of Defence

Co Moderator 'Manufacturing on the Move' LinkedIn Social Networking Group.



A photograph of an airport tarmac at night. A large white airplane is the central focus, with its lights on. In the background, another airplane with a green tail is visible. The sky is a deep blue. A semi-transparent white box with a grid pattern is overlaid on the center of the image, containing the text 'Afternoon Tea' and the time '3.25pm - 3.45pm'.

Afternoon Tea

3.25pm – 3.45pm



Session 2

Workshops

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Rapporteurs please send notes to:

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Head of School
Professor Karin Sanders



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