Survey of Employers in two LGAs in Southwestern Sydney 2013-2014

Final Report to South Western Sydney Manufacturing and Engineering Skills Task Force

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Contents

Acknowledgements 4
Overall Recommendation 5
Recommendations by Employers 6
Executive Summary 8
1. Background 11
2. Profile of Responding Firms 12
   2.1 Industry profile 12
   2.2 Firm Size and Location 13
3. Indicators of Skill Shortage – Unfilled and Hard-to-Fill Vacancies Reported 16
4. Reasons for Skill Gaps 17
5. Specific Skill Gaps Identified 19
6. Sources of Skilled Labour Demand 20
   6.1 Changes in Overall Employment Levels at the Southwestern Sydney Site 21
   6.2 Workforce Ageing and Skill Replacement Needs 22
7. Perceived Changes in Level and Complexity of Skills Required in Main Jobs 23
8. Impacts of Skill Shortages 24
9. Specific Labour Market and Policy Issues Identified 26
   9.1 General Issues of Mis-Match 26
   9.2 More Detailed Analysis 26
10. Remedies Suggested by Respondents 30
11. Conclusion 32
Appendix 1. Details of Industry of Respondents 33

Tables

Table 1 Industry Distribution of Responses 12
Table 2 Firms by Size of SW Sydney Site and Whether Linked to Other Sites 14
Table 3 Responding Firms - Size of Each Site 15
Table 4 Area of Skill Shortage - Firms Reporting Inability to Fill Vacancies 16
Table 5 Skill Gaps Most Commonly Experienced 19
Table 6 Reasons for Seeking New Staff – SW Sydney Firms Reporting Skilled Recruitment Gaps 20
Table 7 Reported Changes in Staffing Levels over Past 5 Years - SW Sydney Worksite 21
Table 8 Firms Reporting Changes in Age Level of Workforce 22
Table 9 Perceived Changes in Skill Content of Main Jobs in Past 5 Years - SW Sydney Employers 23
Table 10 Perceived Change in Skill Complexity of Firm’s Main Jobs in Past 5 Years 23
Table 11 Reported Impacts of Skill Shortages 24
Table 12 Approaches to Meeting Skill Vacancies – SW Sydney Employer Respondents 30
Table 13 Employers’ Suggested Approaches to Filling Skill Vacancies 31
This project was commissioned by the South West Sydney Manufacturing and Engineering Skills Taskforce, which was set up by Regional Development Australia, Sydney to identify the skills and actions needed to help transform manufacturing and drive change.

The project would not have been possible without the commitment and continuous support of Regional Development Australia, Sydney and Manufacturing Skills Australia.

Our thanks to all organisations that assisted with the project, including the employers who responded to the survey.
Overall Recommendation

A lighthouse Regional Manufacturing Innovation and Workforce Development Partnership be piloted, to pioneer a regional program of information exchange and shared workforce development accessible to small and medium businesses.

This Government-funded model would be supported by creating seconded or earmarked cross-organisational staff positions and roles, with the brief of working across employer groups, key training organisations and the three tiers of government. Their brief would be to provide a focus for gathering, exchanging and disseminating information that is timely, targeted, well-integrated and readily digestible. This information would cover:

- Case study approaches to setting up local innovation initiatives
- Environmental scanning of technological developments and locally-relevant market opportunities in Australian and global markets
- Best-practice tools such as strategies and resources for induction and advice about accessing customised delivery of accredited workplace, online and off-site learning to building workplace expertise
- Regional Manufacturing occupational labour market data, and a regional job-matching website specifically for use by local employers and jobseekers.

The Partnership would also provide funding and practical support for the creation of recognized workplace development programs and resource materials supporting small manufacturing businesses in training novices and in upskilling staff.

The Partnership would have initial funding for five years, and be tasked with the specific mission of embedding into ongoing practice the structures and approaches it develops.

Development of the Badgerys Creek Precinct provides a unique catalyst, with significant multiplier effects, for the creation of such a South Western Sydney Advanced Manufacturing Initiative, one of whose focal points might be an Advanced Manufacturing and Aircraft Maintenance hub.

The nucleus of such a regional innovation network already exists, in the work of the Southwestern Sydney Manufacturing and Engineering Skills Council, Business and Employer bodies, the Advanced Manufacturing Council, Regional Development Australia, Sydney; Manufacturing Skills Australia and the Sydney Aerospace and Defence Industry Group. Much of their information clearing house work is fitted in to other roles.

The proposed Innovation Partnership Initiative would provide the higher-profile, cross-sectoral and more coordinated and continuous focus required to act as a catalyst. Only through such an initiative will local employers gain access to the information and workforce development solutions that are currently beyond their capacity to achieve individually, in terms of time and cost.
Summary — Recommendations by Employers

### Industry and Workforce Development Policies:

**Government**

1. Sustained strategy for fostering high quality manufacturing and generating local employment
2. More effective counter-cyclical training strategies, to avoid recurring patterns of under-enrolment in training during slumps and skill shortages during recovery phase
3. More funding support and information dissemination for innovation
4. Support for keeping manufacturing in Australia and SW Sydney until stronger conditions see more skilled staff entering workforce or being trained to a skilled level
5. More funding support for RTOs, manufacturers and individuals to facilitate increased placements in both training organisations and in workplaces
6. Mandatory training of apprentices in larger businesses
7. Incentives to small business to employ and train
8. Government support for rates of pay that will attract and retain more apprentices

### Organisation of Education and Training

**State Government, Registered Training Organisations, Schools, Employers**

9. Collaboration with schools to encourage enrolment in STEM (science technology, engineering, mathematics) subjects and to provide exciting work orientation initiatives that will encourage young people (including girls) into manufacturing careers
10. Development of university and VET (Vocational Education and Training) courses, not currently available in the region, that specialise in advanced manufacturing techniques and technical skills in demand
11. Assistance for RTOs (Registered Training Organisations) and firms working closely with them, to ensure breadth and depth in both theoretical understanding and hand skills
12. New relationship between regional VET and universities, to provide new combinations of technical and service skills
13. Structured opportunities, including job markets, for employers to interview students and jobseekers
14. A new model of group apprenticeship, served in several companies to provide better all-round skills
15. Collaboration amongst employers and RTOs to improving apprentice completion rates and subsequent employment
16. Support for start-ups and very small business owners to build their skills and begin employing and training others

### Initiatives to Improve Operation of Local Labour Markets

**Local Government Authorities, Government Agencies and Employer Organisations**

17. Regular updating and fine-tuning of a skill in demand list
18. More publicity promoting the benefits of apprenticeships
19. Better local talent pool information through a regularly updated on-line register of skilled workers, plus current and projected lists of skill needs and required qualifications/experience
20. Design and web-publication of a structured induction program for firms to use
### Initiatives by Employers

21. Active participation in programs to increase apprenticeship completion rates
22. Paid job orientation programs of at least two weeks, providing structured learning of new role and allowing employers to assess employee suitability
23. Collaboration in group training to allow learners to widen their skill set
24. Support for innovation through pooled engagement of specialists
25. Support for increased practical training, by spreading work placements across several employers
26. Some commitment to employment security to offset low training wage
27. Collaboration between employers and schools/RTOs/job search agencies to provide realistic job previews

### Actions and Attitudes of Job Seekers and Employees

28. Job applicants to prepare and submit firm-relevant resumes when looking for work
29. Greater willingness to undertake training in manufacturing areas
30. Realistic understanding of job demands and acceptance of salaries commensurate with current skill levels
Executive Summary

1) This is a report on the responses of 82 employers in Campbelltown, Fairfield, Narellan, Camden and Smeaton Grange, to a 2013-2014 survey designed to gather employers’ views of their skilled labour needs, in order to remain competitive and grow through innovation.

2) Of a total of 20 industry subdivisions represented in the responses,
   - Almost half were from Fabricated Metal Product Manufacturers or Machinery and Equipment Manufacturing;
   - Other smaller groupings included Transport Equipment Manufacturing (including Aircraft Maintenance, Repair and Overhaul), Professional, Scientific and Technical Services, and Basic Chemical and Chemical Product Manufacturing
   - 23% had 1-9 staff, 37% had 10-29 employees, 27% employed 30-99 workers and 11% employed over 100.
   - 38% had other Australian sites outside Southwestern Sydney (mainly employing under 100 people) and 15% were linked to off-shore sites (some very large, others small).

3) Of the 82 respondents, 31 (38%) had been unable to fill a skilled vacancy in the previous six months. The most numerous shortages were reported among:
   - Engineering (including aircraft maintenance) and IT (Information Technology) technicians: 13% of firms, 35% of unfilled vacancies;
   - Engineering and automotive trades workers: 12% of firms, 32% of unfilled vacancies.

4) Ten reasons for skill gaps were suggested:
   - A general decline in the manufacturing skill base;
   - Young people not entering;
   - Insufficient training places;
   - Apprenticeships need to provide higher skill levels;
   - Job applicants insufficiently skilled to be employable;
   - Employers requiring specific prior experience;
   - Mis-match between skills possessed and wages sought:
   - Barriers to overseas recruitment
   - Unacceptable risk from a bad recruitment choice
   - Employers have given up looking for new recruits.

5) Both technical and non-technical skill gaps were identified, but the most common gaps were in specialist skills (22 firms, 27% of respondents), followed by innovation skills (9 firms, or 11% of respondents).

6) The two most common reasons that firms gave for seeking new staff were:
• Business growth (15 firms, 18% of total, 48% of those with unfilled vacancies)
• Replacement of staff who had left (13 firms, 16% of total, 42% of those with unfilled vacancies).

Over the preceding five years, 48% of firms had shed staff to a noticeable degree, whilst 45% had remained stable and 21% had grown appreciably.

7) It is likely, however, that the need to recruit new staff will grow, for further reasons:
• The average age of the workforce in 41% of respondents’ firms had increased over the past 5 years, but declined (indicating generational change had already occurred) in only 20% of firms.
• A very high number (67 or 82%) of firms reported changes in the skill content of their main jobs over the past 5 years, although it is true that only 12 (15%) reported a significant level of change;
• A sizeable majority (58 or 70%) thought that the skill complexity of their main jobs had increased over the past 5 years, compared with 18 (22%) who thought it had not changed and only 2 (2%) who thought it had declined. Again, only (11 or 13%) thought that much higher complexity levels were now required.

8) Skill shortages were reported as having a general impact on the business of more firms (41 or 50%) than the 31 that had directly experienced recruitment problems over the previous 6 months.

These impacts were of two types:
• Immediate impacts on productivity or profitability: reduced output (54% of those impacted and 27% of all respondents), higher rate of mistakes and re-working (49% and 24% respectively); lost competitiveness (24% and 17%); and loss of contracts (22% and 11%);
• Indirect or longer-term impacts on sustainability: need to micromanage because unqualified workers were doing skilled jobs (both 39% and 20%); curtailment of expansion as firms stopped seeking new business (24% and 12%), and reduced innovation (17% and 9%).

9) Employers were asked to state their own views of the main reasons for skill gaps and shortages. 35 of the 82 respondents (43%) offered comments. They identified a range of mis-match issues:
• Planning for training was seen as needing to take a long-term counter-cyclical approach, not a short-term reactive one;
• Despite a general preference for people with experience, few employers finding it too risky to provide experience to novices by offering them opportunities for on-the-job learning;
The balance between broad based and specialised skill training was seen as needing to be re-examined in both VET and universities;

- The desire to deploy higher skill levels was being thwarted by costs. In a ‘catch 22’ situation, award rates were unattractive to young people but uncomfortably high for employers.

Respondents located the starting point of the problem in various places:

- Individual workers and job applicants - motivation, job search strategies, willingness to develop practical understanding and skills, unrealistic expectations of job content and rewards;

- Employers – unwillingness to take on and train inexperienced workers because of ‘poaching’ fears; mandatory requirements and incentives may be needed to encourage training and information-sharing about innovations;

- The education and training system – more trade training places; more funding for on-the job training; better balance of theory and practice; universities to provide more practical experience; greater consistency of standards; more STEM (science, technology, engineering, mathematics) focus in schools; addressing the gender gap;

- Operation and coordination of labour markets – need for better local, national or international employee/job matching information. Manufacturing wage relativities and capacity to pay issues; mixed views about reliance on skilled migration.

- State and Federal government - industry support and economic policy settings that will support Australian manufacturing, address the currently mis-matched cycles of skill supply and demand, and encourage a shift to more advanced techniques.

10) A range of general and concrete ideas for addressing the skill shortage was proposed. These are summarised in 30 recommendations. It is hoped that these recommendations will provide a useful basis for discussion by the Task Force. They are followed by a summary conclusion, out of which the overall recommendation was developed.
1. Background

In 2013-2014, a survey questionnaire was distributed by UNSW and coordinated by Regional Development Australia (RDA), Sydney on behalf of the Southwestern Sydney Manufacturing and Engineering Task Force. The survey covered firms in Campbelltown, Fairfield, Narellan, Camden and Smeaton Grange, drawn from a mailing list compiled from local directories and by driving through industrial parks.

The survey’s main purpose was to identify issues facing manufacturing and engineering employers in the region, and their views on obstacles and enablers to the region’s role in contributing to industry development. This contribution is seen as fostering Australia’s future development and sovereignty through the pursuit of a high-technology, high-skill approach to production and workforce development.

In South West Sydney, where many people are commuting daily to jobs outside the area, it is seen as important that local manufacturing and engineering firms remain competitive and grow through innovation and better ways to attract, retain, deploy and build a local supply of skilled labour.

In seeking to understand employers’ perspectives on these issues, the survey sought to assist the Task Force in identifying and addressing:

- Supply side issues affecting school leavers, disadvantaged groups and longer term unemployed;
- Steps required to improve the ability of the school, VET and university sectors (including pre-employment training, foundation skills and group training) to meet the needs of local industries;
- Timely ways of ascertaining future need for advanced technical and IT skills, green skills and other specialisations in demand;
- Ways of ensuring that manufacturing careers are attractive to young people;
- Role of the Skilled Migration Program;
- Ways of establishing an information system through which employers can obtain up-to-date information on skills on an ongoing basis.

Overall, in the two LGAs surveyed, valid responses were received from 82 firms (of 86 responses, one was blank and three were duplicate responses from the same firm).
## 2. Profile of Responding Firms

### 2.1 Industry Profile

Table 1 provides a breakdown of the range of industries represented by the responding firms. It is based on responses to the question, ‘What are the main types of product/service your business supplies?’

The responses were matched to four- and six- digit industry descriptors in ANZSIC (Australia and New Zealand Standard Industrial Classification 2006) (Australian Bureau of Statistics and Statistics New Zealand, 2006). Table 1 outlines the broad industry areas represented in the responses, at Division and subdivision level. A fuller breakdown is provided in Appendix 1.

### Table 1 Industry Distribution of Responses, SWS Manufacturing and Engineering Employer Survey, 2013-2014

<table>
<thead>
<tr>
<th>Industry Division</th>
<th>Industry Subdivision</th>
<th>Responses</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C Manufacturing</td>
<td>11 - Food Product Manufacturing</td>
<td></td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>12 - Beverage and Tobacco Product Manufacturing</td>
<td></td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>13 - Textile, Leather, Clothing &amp; Footwear Manufacturing</td>
<td></td>
<td>3</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>14 - Wood Product Manufacturing</td>
<td></td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>15 - Pulp, Paper &amp; Converted Paper Product Manufacturing</td>
<td></td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>16 - Printing</td>
<td></td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>18 - Basic Chemical &amp; Chemical Product Manufacturing</td>
<td></td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>19 - Polymer Product and Rubber Product Manufacturing</td>
<td></td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>20 - Non-Metallic Mineral Product Manufacturing</td>
<td></td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>21 - Primary Metal &amp; Metal Product Manufacturing</td>
<td></td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>22 - Fabricated Metal Product Manufacturing</td>
<td></td>
<td>21</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>23 - Transport Equipment Manufacturing</td>
<td></td>
<td>8</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>24 - Machinery and Equipment Manufacturing</td>
<td></td>
<td>18</td>
<td>22%</td>
</tr>
<tr>
<td>F Wholesale Trade</td>
<td>35 - Motor Vehicle and Motor Vehicle Parts Wholesaling</td>
<td></td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>G Retail Trade</td>
<td>43 - Non-Store Retailing; Commission-Based Buying/Selling</td>
<td></td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>I Transport, Postal &amp; Warehousing</td>
<td>47 - Rail Transport</td>
<td></td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>M Professional, Scientific and Technical Services</td>
<td>69 - Professional, Scientific and Technical Services (except Computing)</td>
<td></td>
<td>5</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>70 - Computer System Design and Related Services</td>
<td></td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>S Other Services</td>
<td>94 - Repair and Maintenance</td>
<td></td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>82</td>
<td>100%</td>
</tr>
</tbody>
</table>

Sources: ABS (2006); Southwestern Sydney Survey 2013-2014
This breakdown suggests that 58% of firms were located in Fabricated Metal Product Manufacturing, Machinery and Equipment Manufacturing and Transport Equipment Manufacturing – the latter group being predominantly aerospace/aircraft maintenance.

As Appendix 1 indicates, in a number of cases it was something of a ‘stretch’ to align the firms’ self-descriptions with the 2006 ANZSIC classifications. This is evident in the number of times the ‘n.e.c’ (‘not elsewhere classified’) category was used. The following explanations are offered:

- ANZSIC classifications tend to be oriented to end-use products, whereas a number of survey respondents were more interested in describing processes, such as additive manufacture, involving the production of bespoke or intermediate goods;
- There are no direct ANZSIC descriptors for production processes such as laser sintering or the production within textile, of the geosynthetic materials now used on a large scale in civil engineering;
- It was hard to find descriptors that applied to the integration of processes such as printing and pulp/paper product manufacture;
- With the growth of through-life service, the distinction between manufacturing and repair is not clear-cut; and it was also hard to find descriptors for the growing business of recycling and refurbishing;
- The strong reliance in existing manufacturing classifications on differentiating metal/non-metal, and ferrous/non-ferrous metal, and the restriction of polymers to production rather than use in combination with metals, made it hard to classify additive and advanced processes for producing and utilising composites and nanotechnology;
- There were not many ANZSIC descriptors to cover specialised, high precision work, the role of CNC and variable tooling, and the changing relationship between engineering design and manufacture, with the result that it was necessary to fall back on the generalised term ‘fabrication’.

These difficulties suggest that since the most recent revision of the ANZSIC industry classifications in 2006, new industries, products and production processes have emerged, and Southwestern Sydney firms are well represented amongst the innovators. An examination of Appendix 1, as well as Table 1, suggests that the respondents were approximately evenly divided between suppliers of products for local construction and consumption, and firms oriented to process innovation and potential integration in export markets.

2.2 Firm Size and Location

Of the 82 respondents, 79 provided usable answers to a question about employee numbers at their Southwestern Sydney site and at other onshore and offshore sites, if any.
As indicated by Tables 2 and 3, the majority of the 79 responding firms were local and small-to-medium enterprises (SMEs):

- The largest number (29 or 37%) employed between 10 and 29 staff;
- Notably, however, 21 firms (27%) were employing 20 to 99 workers, and just under half of these had sites in Southwestern Sydney only;
- 19 (23%) of responding firms had between 1 and 9 employees;
- 9 (11%) had between 100 and 999 employees, and there were no sites in SWS employing 1000 or more workers;
- 30 (38%) of the 79 respondents also had other Australian sites outside Southwestern Sydney. Of these 30 multi-site firms, 21 employed under 100 people at their Southwestern Sydney site and 7 employed over 100 but fewer than 1,000 workers;
- Only 12 firms were branches of overseas firms or had offshore branches, and half of these, 6 (7% of respondents) were linked to overseas firms with 1,000 or more employees.
- The sites elsewhere in Australia were more likely to employ fewer than 100 (19 firms) than to have 100 or more staff (11);
- The offshore sites were almost evenly divided between the 6 employing under 100, and the 7 employing over 100;
- Firms with larger sites in SW Sydney were more likely to have sites elsewhere, or to be branches of larger organisations;

Table 2 Firms by Size of SW Sydney Site and Whether Linked to Other Sites (n=79)

| Table 2 Firms by Size of SW Sydney Site and Whether Linked to Other Sites (n=79) | Firms by Size of SWS Site |  |
|---|---|---|---|---|---|---|---|---|
| | Employee numbers – SWS Site | 0 | 1 to 9 | 10 to 29 | 30 to 99 | 100 to 999 | 1000+ | Total | % of Total |
| Located in SWS only | 0 | 14 | 20 | 10 | 2 | 0 | 46 | 58% |
| Linked to Other Australian Sites Only | 1 | 3 | 9 | 6 | 2 | 0 | 21 | 27% |
| Linked to Overseas Sites Only | 0 | 1 | 0 | 2 | 0 | 0 | 3 | 4% |
| Linked to Other Sites in Both Australia & Overseas | 1 | 0 | 0 | 3 | 5 | 0 | 9 | 11% |
| Total | 2 | 18 | 29 | 21 | 9 | 0 | 79 | 100% |
| % of Total | 3% | 23% | 37% | 27% | 11% | 0% | 100% |

Source: Southwestern Sydney Survey 2013-2014
Table 3 Responding Firms - Size of Each Site (n=79)

<table>
<thead>
<tr>
<th>Site Location</th>
<th>Numbers of Employees at Each Site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>SWS site</td>
<td>2</td>
</tr>
<tr>
<td>Other sites in Australia</td>
<td>49</td>
</tr>
<tr>
<td>Offshore site</td>
<td>66</td>
</tr>
</tbody>
</table>

Source: SWS Survey

- Of the firms with both other Australian and global linkages, three patterns can be discerned:
  - The Southwestern Sydney-based firm that has grown from local origins and managed to achieve a degree of integration into global value networks. Examples include a firm with 100 local employees, 30 employees elsewhere in Australia and 10 overseas range of configurations, and the largest local firm in the survey, with 350 staff in Southwestern Sydney, another 50 employees onshore, and 50 offshore;
  - The organisation of 200 in Southwestern Sydney that is likely to be a branch of a larger Australian firm of 800, with a further 150 employees overseas;
  - The local branch, with 70 or 120 employees, of a global company of 60,000 to 175,000 employees, with 350 or 35,000 employees elsewhere in Australia.

The purpose of this study is to examine ways of supporting the growth of local firms, as well as local employment in Southwestern Sydney. The rest of the report summarises the views of the responding firms on overall trends in manufacturing and engineering industry employment, and in particular indications of their skill requirements and their impressions of the available sources of skill to meet these requirements.
3. Indicators of Skill Shortage – Unfilled and Hard-to-Fill Vacancies Reported

If widespread difficulties in filling skilled vacancies are reported, this can be taken as an indicator of a skill shortage, at least in the short term.

In 2013 and early 2014, of the 82 firms responding to the survey, 31 or 38% stated that in the last 6 months, their Southwestern Sydney business been unable to fill one or more skilled vacancies. Table 4 sets out the main skill areas in which these unfilled vacancies were reported.

Table 4 Area of Skill Shortage - Firms Reporting Inability to Fill Vacancies SW Sydney 2013-2014 (n=82)

<table>
<thead>
<tr>
<th>Firms Unable to Fill Skill Vacancies in Past 6 Months</th>
<th>Number</th>
<th>% of Firms (n=82)</th>
<th>% of Vacancies (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Firms Reporting Unfilled Vacancies</td>
<td>31</td>
<td>38%</td>
<td>100%</td>
</tr>
<tr>
<td>Specific Areas of Skill Shortage (Listed by Frequency)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering, IT Technicians - incl Aircraft Maintenance Engineers</td>
<td>11</td>
<td>13%</td>
<td>35%</td>
</tr>
<tr>
<td>Engineering/Automotive Trades Workers (esp. Sheet Metal Workers, Metal Spinners)</td>
<td>10</td>
<td>12%</td>
<td>32%</td>
</tr>
<tr>
<td>Research, Design, Engineering, Science, IT or Transport Professionals</td>
<td>5</td>
<td>6%</td>
<td>16%</td>
</tr>
<tr>
<td>Electrical or Electronic Trades Workers</td>
<td>5</td>
<td>6%</td>
<td>16%</td>
</tr>
<tr>
<td>Machinery or Plant Operators</td>
<td>5</td>
<td>6%</td>
<td>16%</td>
</tr>
<tr>
<td>Other Trades Workers incl Food</td>
<td>4</td>
<td>5%</td>
<td>13%</td>
</tr>
<tr>
<td>Managerial</td>
<td>4</td>
<td>5%</td>
<td>13%</td>
</tr>
<tr>
<td>Other - incl. Estimators</td>
<td>4</td>
<td>5%</td>
<td>13%</td>
</tr>
</tbody>
</table>

*Some listed more than one area of vacancy
Source: SWS Survey

In summary, technician-level skills were hardest to source, closely followed by engineering trades:

- Engineering (including aircraft maintenance) or IT (Information Technology) skill shortages were reported by 13% of respondents and made up 35% of unfilled vacancies;
- Engineering and automotive trades vacancies (including those with highly specialised skills such as metal spinning) were reported as hard to fill by 12% of respondents (32% of unmet skill requirements);
- Some degree of unmet skill demand was also reported through professional, electrical/electronic trade and plant/machinery operator levels (6% of firms and 16% of vacancies in each case);
- Similarly, managerial, other trade and specialised workers estimators were each reported as being hard to find by 5% of firms and each made up 13% of vacancies.
4. Reasons for Skill Gaps

Responding firms offered ten main reasons for their inability to fill skilled vacancies.

1) A general decline in the manufacturing skill base was perceived:
   - ‘Manufacturing business is declining so no skilled/experienced staff available’
   - ‘High quality skill base tradesmen, skill base is declining rapidly’
   - ‘Lack of contracts’
   - ‘Industry consolidation has reduced the available pool of resources we have traditionally drawn from’
   - ‘They go to mining sector’

2) Young people were seen as not coming into manufacturing:
   - ‘Lack of young applicants’
   - ‘Lack of interest in apprenticeships’

3) But also insufficient training places are seen as being provided:
   - ‘I think we don’t train enough apprentices’
   - ‘Not enough trained trade persons’
   - ‘Lack of suitable qualified candidates’
   - ‘Needed additional courses through TAFE & Universities for brewmasters, brewers’
   - ‘Lack of qualifications …lack of technical licensing’

4) One employer saw apprenticeships as providing insufficient skills/work experience and had a suggestion:
   - ‘Apprentices to be more skilled, suggestion - fitter & machinist in their apprenticeship to be sent to different companies – objective: better skilled’

5) Without such possible solutions, the skill levels of job applicants were seen as low:
   - ‘Incompetent candidates - we are sent applicants with no prior skills’
   - ‘Skilled people are not applying - unskilled applications received’
   - ‘Poorly skilled candidates are somewhat plentiful’

6) A number wanted only job applicants with prior experience:
   - ‘Lack of applicants with engineering (electrical/mechanical) sales experience’
   - ‘Experienced C.N.C. Tradesmen (sic) rare’
   - ‘Applicants do not possess the skills we require nor the experience’
   - ‘Lack of suitably trained/experienced candidates’
7) Some saw wages as too high for the skills possessed:
   ‘Are looking for salaries beyond their experience and capabilities’
   ‘The type of work for the wage. The award for boilermakers, sheet metal workers’

8) Some employers saw barriers to employing overseas-qualified applicants:
   ‘Problem of skilled workers gaining visa to come to Australia’
   ‘Are non-residents or on short-term visas’

9) The selection process was seen as carrying high risks:
   ‘Operators have not performed to equal levels. Poor performers can dramatically affect results in performance - service and technical’

10) As a result, some employers were discouraged from looking for new staff:
    ‘Haven’t had to look for anyone new and every time we do the applicants aren’t skilled enough’
    ‘Lack of time for recruitment process & competing events’
    ‘Only few resumes received hence numerous adverts’
    ‘Not enough time; current overloading’

    Of course, 51 of the 82 responding firms (72%) had not experienced a hard-to-fill vacancy in the previous 6 months. Either they had not experienced a skill gap or they had not had the need or capacity to take on new staff.
5. Specific Skill Gaps Identified

Survey respondents identified specific types of skill that were particularly hard to find, either from within their existing workforces, or in the external labour market. These are summarised in Table 5.

Added comments amplified the responses reflected in Table 5. Some saw technical skills as being in short supply; others focused on non-technical skills:

‘Lack of skilled staff available in the aviation field and sales management field’

‘Manufacturing & engineering skills welding etc’

‘Low levels of qualified die setters’

‘Unable to find mechanical fitters and fluid power trades technician’

‘Definite shortage of 'skilled' boilermakers and welders available’

‘Most now only computer-trained. I need manual workers’

‘Machine we purchase is new and takes a large amount of training’

‘No suitable candidates; have poor communication skills’

‘Lack of qualified available staff for sales with experience in auto using sales process and having knowledge in this field’

‘The skill shortage centres on personnel being able to prepare technical documents, manage information (in soft form) and effective problem solving/teamwork’

‘Skills that would assist are not directly related to a field of expertise but rather self-organisation, and use of technology; ability to think beyond the task at hand and how each element contributes to other business functions’.

Table 5 Skill Gaps Most Commonly Experienced by SW Sydney Survey Respondents 2013-2014 (n=82)

<table>
<thead>
<tr>
<th>Type of Skill Required</th>
<th>Firms Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Specialist Skills</td>
<td>22</td>
</tr>
<tr>
<td>Innovation Skills</td>
<td>9</td>
</tr>
<tr>
<td>Self Management, Problem Solving, Initiative</td>
<td>6</td>
</tr>
<tr>
<td>Managerial Skills</td>
<td>4</td>
</tr>
<tr>
<td>Training Skills</td>
<td>3</td>
</tr>
<tr>
<td>Literacy, Numeracy, Communication Skills</td>
<td>1</td>
</tr>
<tr>
<td>Social, Interpersonal, Customer Service</td>
<td>1</td>
</tr>
<tr>
<td>Teamwork Skills</td>
<td>1</td>
</tr>
<tr>
<td>Green Skills</td>
<td>1</td>
</tr>
<tr>
<td>Other Skills</td>
<td>4</td>
</tr>
</tbody>
</table>

More than one could be ticked

Source: SWS Survey
6. Sources of Skilled Labour Demand

Even firms that had not needed to recruit at the time the survey was undertaken, will eventually face the need to recruit new employees. The reasons include:

- Normal replacement of individual staff members who leave for a variety of personal reasons;
- Waves of replacement, resulting from workforce ageing;
- Expectations of future growth, because business is expanding, or because of rebuilding after a slump;
- Requirements for a new or changed level or mix of skill, with limited time or scope for building these skills in the existing workforce.

Table 6 Reasons for Seeking New Staff – SW Sydney Firms Reporting Skilled Recruitment Gaps, 2013-2014

<table>
<thead>
<tr>
<th>Reason for Seeking New Staff</th>
<th>Number of Firms</th>
<th>As % of Firms Reporting Skill Gaps (n= 31)</th>
<th>As % of All Respondents (n=82)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) To support increase in existing output</td>
<td>15</td>
<td>45%</td>
<td>18%</td>
</tr>
<tr>
<td>2) To replace employee(s) who had left</td>
<td>13</td>
<td>42%</td>
<td>16%</td>
</tr>
<tr>
<td>3) To help move into new markets, products, services</td>
<td>6</td>
<td>19%</td>
<td>7%</td>
</tr>
<tr>
<td>4) To meet existing inefficiencies or knowledge gaps</td>
<td>5</td>
<td>16%</td>
<td>6%</td>
</tr>
<tr>
<td>5) Replacement following internal staff move(s)</td>
<td>4</td>
<td>13%</td>
<td>5%</td>
</tr>
<tr>
<td>6) To support new technology or business practices</td>
<td>5</td>
<td>16%</td>
<td>6%</td>
</tr>
<tr>
<td>7) Other reasons (Mix of 1 &amp;3)</td>
<td>2</td>
<td>6%</td>
<td>2%</td>
</tr>
<tr>
<td>8) Compliance with regulations</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>9) Incentives to reduce environmental impacts</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>10) To build research and development</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

More than one could be ticked
Source: SWS Survey

Table 6 provides a fuller summary of possible reasons why staff vacancies may arise. Such vacancies may not be difficult to fill. Indeed three respondents offered these comments:

‘It’s quite easy to fill vacancies’
‘Satisfied with existing mechanisms’
‘We do not employ skilled workers’.

Nevertheless, Table 6 indicates the number of firms, from among the 31 respondents who reported difficulty in filling skilled vacancies, who reported each of the possible reasons listed, as the basis for their search for new staff. The most common reasons for recruiting new staff were:

- Business growth (15 firms, 18% of total, 48% of those with unfilled vacancies)
- Replacement of staff who had left (13 firms, 16% of total, 42% of those with unfilled vacancies).

When we put firms’ recent recruitment behaviour within a longer-term context, this provides an indicator of possible future skill requirements, whether or not new staff had not recently been sought and successfully recruited.

6.1 Changes in Overall Employment Levels at the Southwestern Sydney Site

Employers were asked to indicate whether employment levels at their Southwestern Sydney site had changed over the past five years. The responses are shown in Table 7. In summary,

- 45% of all firms reported stable staffing levels in the years following the Global Financial Crisis
- 48% had shed staff to a noticeable degree;
- But 21% had grown appreciably;
- A further 6% were not sure, found the question not relevant, or did not answer it.

The fact that firms more firms reported declines in staffing level than reported increases could be indicative of several things:

- The temporary impact of the Global Financial Crisis
- The temporary impact of the mining boom
- General manufacturing industry difficulties
- Technological change, requiring fewer staff
- Difficulty in finding skilled staff, with a resulting impact on output capacity

Table 7 Reported Changes in Staffing Levels over Past 5 Years - SW Sydney Worksite, 2013-2014 (n=82)

<table>
<thead>
<tr>
<th>Compared with 5 years ago, staffing levels at this site are...</th>
<th>Number</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noticeably higher</td>
<td>17</td>
<td>21%</td>
</tr>
<tr>
<td>About the same</td>
<td>37</td>
<td>45%</td>
</tr>
<tr>
<td>Noticeably lower</td>
<td>23</td>
<td>28%</td>
</tr>
<tr>
<td>Not sure/not relevant</td>
<td>3</td>
<td>4%</td>
</tr>
<tr>
<td>Not answered</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: SWS Survey

Eventually, however, firms will need to recruit, if only because of workforce ageing.
6.2 Workforce Ageing and Skill Replacement Needs

Workforce ageing can be taken as an indicator of future skill replacement requirements, other things being equal. Table 8 indicates that the average age of the workforce in 41% of respondents’ firms had increased over the past 5 years.

Table 8 Firms Reporting Changes in Age Level of Workforce at SW Sydney Worksite, 2013-2014 (n=82)

<table>
<thead>
<tr>
<th>Compared with 5 years ago, average age of workforce has...</th>
<th>Number</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased</td>
<td>34</td>
<td>41%</td>
</tr>
<tr>
<td>No change</td>
<td>25</td>
<td>30%</td>
</tr>
<tr>
<td>Decreased</td>
<td>16</td>
<td>20%</td>
</tr>
<tr>
<td>Not sure/not relevant</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>Not answered</td>
<td>3</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: SWS Survey

Whilst this increase in workforce age was partly a reflection of the levels of staffing stability indicated in Table 7, it also signalled a possible future need for replacement staffing:

- In 30% of responding firms, the age structure had not changed, reflecting a balance between retirements or other sources of loss of older staff and new recruitment;
- In 20% of cases, a younger workforce was now in place, possibly because generational change had already occurred.
7. Perceived Changes in Level and Complexity of Skills Required in Main Jobs

A further long-term indicator of future skill requirements can be gained from recent rises or falls in the trending skill levels of existing jobs, particularly the main jobs in the firm. The Survey asked employers whether they believed their main skill requirements had changed over the past five years. Two dimensions of skill change were studied:

- Whether the skill **content** of the main jobs in the business had changed
- The direction of any change, measured by perceived level of skill **complexity**.

The responses are summarised in Tables 9 and 10.

**Table 9 Perceived Changes in Skill Content of Main Jobs in Past 5 Years - SW Sydney Employers (n=82)**

<table>
<thead>
<tr>
<th>Skill CONTENT of jobs has changed...</th>
<th>Number</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significantly</td>
<td>12</td>
<td>15%</td>
</tr>
<tr>
<td>Moderately</td>
<td>55</td>
<td>67%</td>
</tr>
<tr>
<td>Not at all</td>
<td>13</td>
<td>16%</td>
</tr>
<tr>
<td>Not sure/not relevant</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Not answered</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: SWS Survey

Table 9 indicates that 67 (82%) of the 82 respondents reported a change in the skill content of the main jobs in their enterprises over the past five years, although only 12 (15%) reported a significant level of change.

In terms of the direction of change, Table 10 indicates that only 2 employers (2%) saw skill complexity as having declined over the past 5 years. 18 (22%) thought there had been no perceptible change. A majority of 58 (70%) thought that skill complexity had increased, with 11 (13%) saying that the main job in their firm now required much higher levels of skill complexity than 5 years ago.

**Table 10 Perceived Change in Skill Complexity of Firm’s Main Jobs in Past 5 Years, SW Sydney Employers (n=81)**

<table>
<thead>
<tr>
<th>Skill COMPLEXITY compared with 5 years ago is ...</th>
<th>Number</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much higher</td>
<td>11</td>
<td>13%</td>
</tr>
<tr>
<td>Somewhat higher</td>
<td>47</td>
<td>57%</td>
</tr>
<tr>
<td>No change</td>
<td>18</td>
<td>22%</td>
</tr>
<tr>
<td>Lower</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Not sure/not relevant</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Not answered</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: SWS Survey
8. Impacts of Skill Shortages

We turn now to the consequences of skill shortages and gaps.

All firms were invited to answer the question, ‘In the last six months, have skill shortages/gaps affected the way you do business?’ This was because a general climate of skill shortage or glut in the labour market might have affected firms other than those directly experiencing difficulty in recruiting skilled staff.

In fact, 41 (50%) of the 82 responding organisations indicated that skill shortages or gaps were affecting their business, one-third as many again as the number of firms directly experiencing skilled staffing difficulties.

When asked to indicate the relevance of a range of possible impacts, these firms responded as set out in Table 11.

Table 11: Reported Impacts of Skill Shortages – SW Sydney Survey Respondents

<table>
<thead>
<tr>
<th>Business Impacts of Skill Shortage</th>
<th>Firms Reporting Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>More overtime worked</td>
<td>24</td>
</tr>
<tr>
<td>Reduced output</td>
<td>22</td>
</tr>
<tr>
<td>Mistakes, defects, reworking</td>
<td>20</td>
</tr>
<tr>
<td>Need to micro-manage employees</td>
<td>16</td>
</tr>
<tr>
<td>Unqualified workers doing jobs</td>
<td>16</td>
</tr>
<tr>
<td>Lost competitiveness</td>
<td>14</td>
</tr>
<tr>
<td>Stopped seeking new business</td>
<td>10</td>
</tr>
<tr>
<td>Loss of existing contracts</td>
<td>9</td>
</tr>
<tr>
<td>Reduced innovation</td>
<td>7</td>
</tr>
<tr>
<td>Other effects</td>
<td>6</td>
</tr>
</tbody>
</table>

More than one impact could be indicated

Source: SWS Survey

The main impact - more overtime by existing qualified employees (99% of those immediately affected, 29% of all respondents) – is not sustainable in the long run. Other impacts were also significant, either in their immediate or longer-term impacts.

Immediate impacts on profitability included:

- Reduced output (54% of those impacted and 27% of all respondents), higher rate of mistakes and re-working (49% and 24% respectively); lost competitiveness (245 and 17%); and loss of contracts (22% and 11%).

Less direct and longer-term projected impacts on sustainability included:

- Need to micromanage because unqualified workers were doing skilled jobs (both 39% and 20%); curtailment of expansion as firms stopped seeking new business (24% and 12%), and reduced innovation (17% and 9%).

The six respondents who nominated other impacts gave concrete (and gloomy) examples:
‘Down turn in business cancelled need to replace staff that left’
‘Had to outsource some testing to overseas laboratories’
‘Workers forced to do other roles to fill void’
‘New CNC is sitting idle’
‘Business literally shut down’

‘Not getting contracts in Sydney - all work being done in China at cheaper cost. No Sydney manufacturer can compete – all closing down’ (in other words, local skills are available only at much higher cost).
9. Specific Labour Market and Policy Issues Identified

Employers were asked to state their own views of the main reasons for skill gaps and shortages. 35 of the 82 respondents (43%) offered comments. These can be classified according to whether their main focus was on problems associated with individual employees or firms, or the training system; or on whether they looked mainly to the operation of labour markets, government policies or the national/international economic system. General expressions of concern were also helpful in clarifying problems and causes.

9.1 General Issues of Mis-Match

Respondents identified a range of mis-match issues:

- Planning for training was seen as needing to take a long-term counter-cyclical approach, not a short-term reactive one – it was noted that there is a shortage of manufacturing jobs and an over-supply of skills during downturns, but when manufacturing recovers there will be again be ‘a large shortage of skills available’

- There was a general preference for people with experience, but few were seen to be looking at ways of providing on-the-job learning experience;

- The balance between broad based and specialised skill training was seen as needing to be re-examined, with further clarification and better integration of the role of TAFE versus the role of on-the-job training;

- It was noted that employers want higher skill levels, but there was also a feeling that the market rate for these skills is too high: this was seen as an unresolved dilemma;

- One respondent referred to a ‘catch 22’ situation whereby award rates are not high enough to attract young people but manufacturers finding labour costs are already uncomfortably high;

- Young people without experience were thought to have unrealistic wage expectations; in part because trades wages were said to be low relative to those offered in service work;

- Young people were seen as not coming through into trades – there may be an under-supply of school leavers with STEM (science, technology, engineering, mathematics) based strengths;

- Gender issues remain as a limitation on the recruitment pool.

9.2 More Detailed Analysis

1) Some responses located the problem in workers and job applicants as individuals, who were seen to have poor motivation, inadequate job search strategies, limited practical
understanding, reluctance to develop the requisite skills, or inflated expectations about job content and rewards:

‘If they sent in resumes when looking for work’
‘People willing to learn and be trained’
‘Being able to identify well motivated people’
‘Lower wage/salary expectation’

‘Seriously the bottom line is, they should not be taking on the training without a passion for the job; too many people get degrees but can’t use them as they are clearly not suitable for the job. No drive or passion to enable them’

2) Some responses saw the issue as partly an employer responsibility. For example, if all employers seek only experienced workers, then none will be taking on the responsibility to provide appropriate placements and guidance for inexperienced workers. But the ‘free rider problem’ means that individual employers fear that if they invest in developing novices, their competitors will ‘poach’ them. Through a combination of mandatory requirements and incentives, employers were seen as needing to be encouraged to train, to share information about innovations and to help each other build a pool of skilled staff:

‘[The problem is not one of inability to locate staff as] …there are plenty of agencies out there chasing companies’

‘Most trained staff are new to the relative jobs and have no idea with the positions involve, they have the theory but no common sense or problem solving skills or getting a job done’

‘Better orientation system’

‘A 2-week training program to assist the learning/knowledge of new role’

‘Access to more skilled workers in other companies’

‘To know the individual beforehand; collaboration’

‘Force larger businesses to train apprentices. Provide incentives for small business to employ and train’

3) Some responses attributed the problem primarily to the current structure and operation of the education and training system. There were thought to be insufficient trade training places. Smaller employers, and those providing their own training, were seen as needing more support in providing training. Whilst some wanted the emphasis of training to change, for example, to be more job-specific, others saw the need for a balance of theory and practice. To meet the need for advanced manufacturing skills, it was thought that universities should also provide more practical experience. Some thought that the present training market was providing inconsistent standards.

‘If more were trained’

‘More apprentices completing trades’

‘Larger resource pool, dedicated diesel trade apprenticeship’
'Have more young people doing engineering (welding) in TAFE & government subsidies to smaller companies - too few studying in this area'

Insufficient training in hand skills – training system is placing over-reliance on computer-based training (paraphrased)

‘Balance of practical and academic training’

‘If universities embraced technical skills - not available in Australia’

‘For the majority of my workforce we train internally (we have our own RTO) - additional funding would help’

‘The level of training and experience of candidates is highly variable. A higher level of general competency would make recruiting easier’.

4) Some responses attributed the problem to failures in the operation or coordination of labour markets – for example inadequate local, national or international employee/job matching information. Some saw manufacturing wages as too low to attract workers, but too high for employers to afford. There were mixed views about reliance on skilled migration.

‘Only a few resumes are received hence the need for numerous advertisements’

‘Be able to quickly & easily view the pool of skilled workers available in the market and their experience & qualifications’

‘Location issues – workplaces are remote from the homes of the skill pool’

‘Greater talent pool of skills’

‘The skill base is declining rapidly’

‘Hard to establish a stable skill base for a small, highly specialised industry’

‘Skilled workers are encountering difficulties in gaining visas to come to Australia’

‘There is too much reliance on non-residents or on short-term visas’

5) In the face of these issues, a number of respondents looked to State and Federal government for industry support and economic policy settings that will better meet the vital need to maintain Australian manufacturing, and to support a move to more advanced techniques:

‘Having Government acknowledge and do something about the skill shortage’

‘Having a Government that works with us … There has been no work around for 8 months’

‘More work and a stable economy’

‘More manufacturing in Australia’

‘More work in Australia, to sustain high quality manufacturing in Australia’

‘Would like to move to higher skilled production but unable to’

‘The manufacturing sector is flat and there is no vacancies in any position. There is not a shortage of skills as there is plenty of skilled personnel looking for jobs due to the downturn in
manufacturing. However when manufacturing recovers there will be a large shortage an overall increased interest in our country’

‘Stronger manufacturing conditions will see more skilled staff entering workforce or be trained to a skilled level - keep manufacturing in Australia’.
10. Remedies Suggested by Respondents

Employers were asked to rate the effectiveness of a range of approaches to meeting skill needs, according to whether they had found them ‘highly useful’, ‘or some use’, ‘not useful’ or ‘not known/not relevant’. Of the 82 respondents, 77 answered some parts of the question. There were however high numbers of ‘don’t know/not relevant’ responses to this question. Assessments of usefulness are shown in Table 12.

Table 12 Approaches to Meeting Skill Vacancies – SW Sydney Employer Respondents (n=77)

<table>
<thead>
<tr>
<th>Method</th>
<th>Highly Useful</th>
<th>Of Some Use</th>
<th>Not Useful</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>Directly employed apprentices</td>
<td>22</td>
<td>29%</td>
<td>20</td>
</tr>
<tr>
<td>Informal training/coaching</td>
<td>16</td>
<td>21%</td>
<td>30</td>
</tr>
<tr>
<td>Temporary migration (eg 457 visas)</td>
<td>13</td>
<td>17%</td>
<td>13</td>
</tr>
<tr>
<td>Sponsored permanent migration</td>
<td>13</td>
<td>17%</td>
<td>12</td>
</tr>
<tr>
<td>Graduate/postgraduate recruitment</td>
<td>10</td>
<td>13%</td>
<td>26</td>
</tr>
<tr>
<td>Temporary hire/contracting</td>
<td>9</td>
<td>12%</td>
<td>27</td>
</tr>
<tr>
<td>Selected Training Package units</td>
<td>8</td>
<td>10%</td>
<td>29</td>
</tr>
<tr>
<td>Group training</td>
<td>6</td>
<td>8%</td>
<td>28</td>
</tr>
<tr>
<td>Vendor training</td>
<td>6</td>
<td>8%</td>
<td>24</td>
</tr>
<tr>
<td>Research collaboration</td>
<td>6</td>
<td>8%</td>
<td>14</td>
</tr>
<tr>
<td>Non-accredited training courses</td>
<td>5</td>
<td>6%</td>
<td>19</td>
</tr>
</tbody>
</table>

More than one impact could be indicated
Source: SWS Survey

The temporary and permanent migration options had relatively high ‘Very Useful’ ratings but lower ‘Of Some Use’ ratings than the other options. A question that should have been asked was one relating to full use of training packages, as responses to an open-ended question indicated quite a level of demand for fully-qualified recruits.

Employers were also asked ‘What would make it easier for you to fill vacancies for skilled workers?’ Table 13 summarises concrete proposals that form the basis of recommendations.
### Table 13: Employers’ Suggested Approaches to Filling Skill Vacancies – Southwestern Sydney Survey 2013-1014

<table>
<thead>
<tr>
<th>Area of Responsibility</th>
<th>Approaches to Solutions</th>
</tr>
</thead>
</table>
| **Government – Industry and Workforce Development Policy** | 1. Sustained strategy for fostering high quality manufacturing and generating local employment  
2. More effective counter-cyclical training strategies, to avoid recurring patterns of under-enrolment in training during slumps and skill shortages during recovery phase  
3. More funding support and information dissemination for innovation  
4. Support for keeping manufacturing in Australia and SW Sydney until stronger conditions see more skilled staff entering workforce or being trained to a skilled level  
5. More funding support for RTOs, manufacturers and individuals to facilitate increased placements in both training organisations and in workplaces  
6. Mandatory training of apprentices in larger businesses  
7. Incentives to small business to employ and train  
8. Government support for rates of pay that will attract and retain more apprentices |
| **Organisation of Education/Training** | 9. Collaboration with schools to encourage enrolment in STEM subjects and to provide exciting work orientation initiatives that will encourage young people (including girls) into manufacturing careers  
10. Development of university and VET courses, not currently available in the region, that specialise in advanced manufacturing techniques and technical skills in demand  
11. Assistance for RTOs and firms working closely with them, to ensure breadth and depth in both theoretical understanding and hand skills  
12. New relationship between regional VET and universities, to provide new combinations of technical and service skills  
13. Structured opportunities, including job markets, for employers to interview students and jobseekers  
14. A new model of group apprenticeship, served in several companies to provide better all-round skills  
15. Collaboration amongst employers and RTOs to improving apprentice completion rates and subsequent employment  
16. Support for start-ups and very small business owners to build their skills and begin employing and training others |
| **Local Initiatives to Improve Operation of Labour Markets** | 17. Regular updating and fine-tuning of a skill in demand list  
18. More publicity promoting the benefits of apprenticeships  
19. Better local talent pool information through a regularly updated on-line register of skilled workers, plus current and projected lists of skill needs and required qualifications/experience  
20. Design and web-publication of a structured induction program for firms to use  
21. Better collaboration between employers and schools/RTOs/job search agencies to provide realistic job previews |
| **Employer Initiatives** | 22. Active participation in programs to increase apprenticeship completion rates  
23. Paid job orientation programs of at least two weeks, providing structured learning of new role and allowing employers to assess employee suitability  
24. Collaboration in group training to allow learners to widen their skill set  
25. Support for innovation through pooled engagement of specialists  
26. Support for increased practical training, by spreading work placements across several employers  
27. Some commitment to employment security to offset low training wage |
| **Jobseeker Approaches** | 28. Job applicants to prepare and submit firm-relevant resumes when looking for work  
29. Greater willingness to undertake training in manufacturing areas  
30. Realistic understanding of job demands and acceptance of salaries commensurate with current skill levels |

Source: SW Sydney Survey
Conclusion

Eighty-two Southwestern Sydney manufacturing and engineering employers expressed a united view of what they need in order to flourish and maximise their economic contribution:

- A steady and reliable source of skilled, well-trained and work-ready employees— one that is not subject to cycles of under-and over-supply linked to the business cycle;
- Better information about innovation and about the available supply of well-matched workers;
- Creation of a pool of skilled and experienced workers from which to recruit, even if individual small employers lack the resources to contribute to this pool by their own training effort.

Their 30 most frequently-mentioned recommendations can be addressed through a single initiative, that outlined below.

It is recommended that a lighthouse Regional Manufacturing Innovation and Workforce Development Partnership be piloted, to pioneer a regional program of information exchange and shared workforce development accessible to small and medium businesses.

The nucleus of such a regional innovation network already exists, in the work of the Southwestern Sydney Manufacturing and Engineering Skills Council, Business and Employer bodies, the Advanced Manufacturing Council, Regional Development Australia, Sydney; Manufacturing Skills Australia and the Sydney Aerospace and Defence Industry Group. Much of their information clearing house work is fitted in to other roles.

The proposed Innovation Partnership Initiative would provide the higher-profile, cross-sectoral and more coordinated and continuous focus required to act as a catalyst. Only through such an initiative will local employers gain access to the information and workforce development solutions that are currently beyond their capacity to achieve individually, in terms of time and cost.
## Appendix 1 Survey of SWS Manufacturing and Engineering Firms 2013/2014 – Details of Industry of Respondents (n=82)

<table>
<thead>
<tr>
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<th>No.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>C11 - Food Product Manufacturing</td>
<td>2</td>
<td>1111 Meat and Meat Product Manufacturing</td>
<td>2</td>
<td>Meat Products; Wholesale Deboned Meat (2)</td>
</tr>
<tr>
<td>C12 - Beverage and Tobacco Product Manufacturing</td>
<td>1</td>
<td>1212 Beer Manufacturing</td>
<td>1</td>
<td>Boutique Beer and Cider Mfg</td>
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<tr>
<td>C13 - Textile, Leather, Clothing &amp; Footwear Manufacturing</td>
<td>3</td>
<td>1313 Synthetic Textile Manufacturing</td>
<td>1</td>
<td>Geosynthetic Products for Civil Engineering</td>
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<tr>
<td></td>
<td></td>
<td>1331 Textile Floor Covering Manufacturing</td>
<td>1</td>
<td>Modular Carpet Manufacture</td>
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<tr>
<td></td>
<td></td>
<td>1351 Clothing Manufacturing</td>
<td>1</td>
<td>Production and Design - Fashion</td>
</tr>
<tr>
<td>C14 - Wood Product Manufacturing</td>
<td>2</td>
<td>1492 Wooden Structural Fitting and Component Manufacturing</td>
<td>1</td>
<td>Doors and Windows</td>
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<tr>
<td>C15 - Pulp, Paper &amp; Converted Paper Product Manufacturing</td>
<td>1</td>
<td>1521 Corrugated Paperboard &amp; Paperboard Container Manufacturing</td>
<td>1</td>
<td>Fibreboard Packaging</td>
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<tr>
<td>C16 - Printing</td>
<td>2</td>
<td>1611 Printing</td>
<td>2</td>
<td>Printed Packaging; Printed Stationery</td>
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<tr>
<td>C18 - Basic Chemical and Chemical Product Manufacturing</td>
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<td>181 Basic Chemical Manufacturing</td>
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<td>Chemical Supplies n.e.c.</td>
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<td>1821 Synthetic Resin &amp; Synthetic Rubber Manufacturing</td>
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<td>Plastics Industry Raw Materials; Plastic and Rubber Components (2)</td>
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<td></td>
<td></td>
<td>1852 Cosmetic and Toiletry Preparation Manufacturing</td>
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<td>Consumer Products - Personal Care</td>
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<tr>
<td>C19 - Polymer Product and Rubber Product Manufacturing</td>
<td>2</td>
<td>1911 Polymer Film and Sheet Packaging Material Manufacturing</td>
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<td>Flexible Packaging</td>
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<td>1912 Rigid and Semi-Rigid Polymer Product Manufacturing</td>
<td>1</td>
<td>Injection Moulded Items</td>
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<tr>
<td>C20 - Non-Metallic Mineral Product Manufacturing</td>
<td>4</td>
<td>203 Cement, Lime, Plaster and Concrete Product Manufacturing</td>
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<td>Construction Products n.e.c.</td>
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<td></td>
<td></td>
<td>2034 Concrete Product Manufacturing</td>
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<td>Concrete Products; Fibres for Cement and Bitumen; Sundry building products; Masonry Walls (3)</td>
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<tr>
<td></td>
<td></td>
<td>2122 Steel Pipe and Tube Manufacturing</td>
<td>1</td>
<td>Specialised tube &amp; pipe bending. Metal fabrication</td>
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<tr>
<td></td>
<td></td>
<td>2142 Aluminium Rolling, Drawing, Extruding</td>
<td>1</td>
<td>Aluminium Extrusion</td>
</tr>
</tbody>
</table>

Key: Mfg = Manufacturing; n.e.c. = not elsewhere classified
## Appendix 1 Survey of SWS Manufacturing and Engineering Firms 2013/2014 – Details of Industry of Respondents  
\( n=82 \)  

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</tr>
</thead>
<tbody>
<tr>
<td>C21 – Primary Metal and Metal Product Manufacturing</td>
<td>2</td>
<td>2122 Steel Pipe and Tube Manufacturing</td>
<td>1</td>
<td>Specialised Tube and Pipe Bending, Metal Fabrication</td>
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<tr>
<td></td>
<td></td>
<td>2142 Aluminium Rolling, Drawing, Extruding</td>
<td>1</td>
<td>Aluminium Extrusion</td>
</tr>
<tr>
<td>C22 Fabricated Metal Product Manufacturing</td>
<td>21</td>
<td>2221 Structural Steel Fabricating</td>
<td>2</td>
<td>Steel Fabrication; Structural Steelwork and Welding (2)</td>
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<td></td>
<td></td>
<td>2222 Prefabricated Metal Building Manufacturing</td>
<td>1</td>
<td>Computer-Designed Rolled Steel Prefabricated Structures; Structural Insulated Roof and Wall Panels</td>
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<td></td>
<td>2223 Architectural Aluminium Product Manufacturing</td>
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<td>Aluminium roller shutters (2)</td>
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<td></td>
<td>2229 Other Structural Metal Product Manufacturing</td>
<td>3</td>
<td>Stainless Steel Manufactured Products: Benchwork; Handrails, Balustrades- Architectural (3)</td>
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<tr>
<td></td>
<td></td>
<td>2292 Precision Nut, Bolt, Screw and Rivet Manufacturing</td>
<td>3</td>
<td>Metal Spinning</td>
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<td></td>
<td>2293 Metal Coating and Finishing</td>
<td>3</td>
<td>Metal Spinning</td>
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<td>2299 Other Fabricated Metal Product Manufacturing n.e.c.</td>
<td>11</td>
<td>Advanced Manufacturing</td>
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<td></td>
<td></td>
<td>Light Fabrication; Precision Engineering; Laser &amp; Press (3)</td>
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<td></td>
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<td></td>
<td>Cutting and Welding - All Metals</td>
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<td></td>
<td></td>
<td>Brass Fittings etc for Engineering, Building Industry (2)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Roll Forming Metal Products</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aerosol Valves and Actuators</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Custom-Made Stainless Steel Kitchen Equipment</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Water Pump Seals</td>
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<td>C23 - Transport Equipment Manufacturing</td>
<td>8</td>
<td>2393 Railway Rolling Stock Manufacturing &amp; Repair Services</td>
<td>1</td>
<td>Disc Pads and Brake Shoe Manufacture - Rail Industry</td>
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<td></td>
<td></td>
<td>2394 Aircraft Manufacturing and Repair Services</td>
<td>7</td>
<td>Helicopter/Aircraft Maintenance, Overhaul, Repair, Assembly (4)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Avionics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aviation/Aerospace n.e.c. (2)</td>
</tr>
</tbody>
</table>

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### Appendix 1 Survey of SWS Manufacturing and Engineering Firms 2013/2014 – Details of Industry of Respondents (n=82) – p3

<table>
<thead>
<tr>
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<th>No.</th>
<th>Respondent Self-Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>C24 - Machinery &amp; Equipment Mfg</td>
<td>18</td>
<td>2419 Other Professional and Scientific Equipment Manufacturing</td>
<td>2</td>
<td>In-Motion Weighing systems for Mining, Shiploading Clock manufacture repair and sales</td>
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<tr>
<td></td>
<td></td>
<td>2421 Computer and Electronic Office Equipment Manufacturing</td>
<td>1</td>
<td>Point of Sale Displays</td>
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<tr>
<td></td>
<td></td>
<td>2422 Communication Equipment Manufacturing</td>
<td>2</td>
<td>Communications Antennas; Wireless (2)</td>
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<tr>
<td></td>
<td></td>
<td>2429 Other Electronic Equipment Manufacturing</td>
<td>2</td>
<td>Innovators in display technology - Avionics and Engineering; Prototype Electrical Circuitry (2)</td>
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<tr>
<td></td>
<td></td>
<td>2451 Pump and Compressor Manufacturing</td>
<td>1</td>
<td>Manufacturing /Engineering (Fluid Power)</td>
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<tr>
<td></td>
<td></td>
<td>2452 Fixed Space Heating/Cooling/Ventilation Equipment Mfg</td>
<td>1</td>
<td>Commercial Air Conditioning Equipment Manufacture</td>
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<td></td>
<td></td>
<td>2462 Mining and Construction Machinery Manufacturing</td>
<td>2</td>
<td>Heavy Engineering, Pressure Equipment for Mining, Oil, Gas (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2463 Machine Tool and Parts Manufacturing</td>
<td>3</td>
<td>Mechanical, Tooling, CNC for Metal Fabrication, Structural Steel (3)</td>
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<tr>
<td></td>
<td></td>
<td>2469 Other Specialised Machinery and Equipment Mfg n.e.c.</td>
<td>1</td>
<td>Design of New /Replacement Parts for Machinery</td>
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<tr>
<td></td>
<td></td>
<td>2499 Other Machinery and Equipment Manufacturing n.e.c.</td>
<td>3</td>
<td>Sport Training Equipment Manufacture Manufacturing /Repair/Refurbishment/Decommissioning n.e.c. (2)</td>
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<tr>
<td>F35 - Motor Vehicle and Motor Vehicle Parts Wholesaling</td>
<td>1</td>
<td>3505 Motor Vehicle Dismantling and Used Parts Wholesaling</td>
<td>1</td>
<td>Auto Recycling</td>
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<tr>
<td>G43 - Non-Store Retailing; Commission-Based Buying/ Selling</td>
<td>1</td>
<td>4310 Non-Store Retailing</td>
<td>1</td>
<td>Retail - Agent for Other Manufacturers</td>
</tr>
<tr>
<td>I47 - Rail Transport</td>
<td>1</td>
<td>4710 Rail Freight Transport</td>
<td>1</td>
<td>Rail Logistics, Supply Chain Consultancy</td>
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<td></td>
<td></td>
<td>6925 Scientific Testing and Analysis Services</td>
<td>2</td>
<td>Scientific Testing - Therapeutic Goods, Biotech, Pharma. Medical Devices (2)</td>
</tr>
<tr>
<td>M70 - Computer System Design and Related Services</td>
<td>1</td>
<td>7000 Computer System Design and Related Services</td>
<td>1</td>
<td>Software Development</td>
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<tr>
<td>S94 - Repair and Maintenance</td>
<td>3</td>
<td>9419 Other Automotive Repair and Maintenance</td>
<td>1</td>
<td>Diesel engines - sales, parts and service</td>
</tr>
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<td></td>
<td></td>
<td>9422 Electronic &amp; Precision Equipment Repair &amp; Maintenance</td>
<td>2</td>
<td>IT &amp; Consumer Electronics Through Life Service; Computer &amp; Network Maintenance &amp; Repair (2)</td>
</tr>
</tbody>
</table>

Key: Mfg = Manufacturing; n.e.c. = not elsewhere classified  
Source: ABS and SNZ (2006)
Appendix 2 A Second Sydney Airport – Aviation and Aerospace Precinct – An Opportunity to Build an Advanced Manufacturing and Engineering Skills Hub in Southwestern Sydney

(Disclaimer: This appendix represents research undertaken by A. Junor and should not be taken as necessarily representing the views of all industry partners. It was as accurate as the author could make it in April 2015).

A major opportunity for boosting jobs and skills, as well as business and economic activity, in Western and Southwestern Sydney lies with the planning process for the Second Sydney Airport. There are strong arguments that integral to the planning for the Second Airport should be planning for its role as part of a civilian and Defence aerospace complex stretching from Nowra to Richmond and providing:

- A landside Aerospace and Advanced Manufacturing Precinct
- State-of-the-art third party aircraft maintenance repair and overhaul facilities, with hangars for the maintenance, repair, overhaul and refurbishment of civilian aircraft and components across the range of air operations from general aviation, helicopter, balloons and business jets to RPT; as well as for Defence contracting
- The development of attractive administrative facilities designed in partnership with CASR Part 42 Continuing Airworthiness Maintenance Organisations (CAMOs), and looking ahead to the future inclusion of General Aviation (GA) within the CASR regulatory framework
- Provision for R&D and prototype testing, linked to the network of advanced manufacturing and engineering firms in the area, working for example on composites, aerometal treatments and coatings; on 3-D component printing; on fabrication, precision tooling and on new developments eg in recycling and biofuel technology;
- Operational facilities to allow Original Equipment Manufacturers (OEMs) and logistics firms to integrate the airport into regional and global supply chain networks, based on the dispatch of both approved parts and maintenance staff to aircraft-on-ground (AOG) incidents in the Asia-Pacific region;
- The redevelopment and expansion of Padstow TAFE as a MTO (Maintenance Training Organisation), working with other type-training providers currently operating in the region, to provide recognised licence training and training for the maintenance of a range of aircraft/component categories and types, so that SW Sydney can help Australia prepare for the looming national, regional and global shortage of maintenance engineers.

The arguments for the inclusion of an aviation, maintenance, aerospace and advanced manufacturing precinct are summarised here under five headings:

1) Potential benefits — Multiplier and catalytic effects on regional economy
2) Overseas evidence of benefits
3) Already-strong existing basis in the Western and South-West Sydney region
4) Indications of need and opportunity, including analysis of Sydney Airport Master Plan
5) Evidence of importance of government economic and infrastructural support, but also of strong revenue returns.

1) Potential benefits - Multiplier and catalytic effects on of an airport and aerospace precinct

The methodology for calculating local, regional, state and national multiplier and catalytic effects is well developed in the US. The 2013 NSW Business Chamber study of the Economic Impact of a Western Sydney Airport, conducted by Deloitte, applied one of these
methodologies. While convincingly argued in the areas it covered, the Deloitte study focused heavily on the impact of passenger numbers and freight volume in building local service industries. Its analysis could be further extended to include the potential impacts of building on the existing manufacturing and engineering skills base through an expanded aerospace and aircraft maintenance precinct, networked to existing Southwestern Sydney technology parks.

It is thus recommended that a further specific analysis be added, to include the potential contribution of aircraft maintenance, maintenance management and training and aerospace manufacturing.

**Overview of impact assessment methods**

A study for the US National Academies of the Sciences, sponsored by the FAA (Federal Aviation Authority), provides an evaluative overview of methods and models for assessing airport impacts (Joakim Karlsson, Hoyle, Tanner and Associates, 2008). It identified three common approaches:

- **Input–output method**, typically measuring the sum of:
  - Direct effects (airport employment and output);
  - Indirect effects (employment and output generated off-airport)
  - Induced or multiplier effects caused by successive rounds of spending throughout the economy, resulting from direct and indirect effects

- **Collection of benefits method**: quantitative or qualitative measures of benefits and costs including:
  - Time saved; costs avoided by using air transportation;
  - Capacity improvements through reliever airports;
  - Stimulation of business, recreation, and commercial activities;
  - Community benefits.

- **Catalytic or spillover method** (less common): measuring how the airport enhances supply-side performance, eg
  - Dollar value of impacts on investment, trade, and overall productivity of the economy.

Focusing on 58 impact studies of hub, non-hub commercial and general aviation airports, it identified the following factors as being frequently omitted from impact studies:

- Growth in air freight (the fastest-growing freight mode, importance in global supply chains)
- Adjacent non-aviation commercial development attracted to the vicinity;
- Use of air transportation in supply chains and just-in-time delivery;
- Reliance on aviation by industries such as research and development, biotech, banking, and universities, as well as tourism;
- Growth in general aviation specialty modes such as business aviation, fractional ownership, very light jets in the context of globalisation, and the attendant maintenance business opportunities;
- Increased focus of larger airports on providing international gateways; shifts in passenger and freight hubs in the context of a global economy;
- Investment impacts, productivity improvements and tax revenue impacts.

The 2013 Deloitte study for the NSW Business Chamber was exemplary in its specific benchmarking of:

- Existing airports in Australia and New Zealand,
- Other comparable sites such as Gold Coast and Avalon, and in particular:
Other second airports such as London Luton and Glasgow Prestwick.

It combined the collection-of-benefits and spillover approaches identified by the National Academies study. This approach was mandated by the inevitable absence of actual input or output data, given that Sydney’s second airport is not yet built.

The Deloitte study considered three growth scenarios, focusing on the employment and resulting economic stimulus effects of construction and airport use. It considered several factors identified by the US National Academies as often missing, such as freight forwarding.

The study concentrated on the more readily quantifiable impacts of increased passenger numbers and freight volume. However, it did not consider the stimulation of aircraft maintenance or aerospace manufacturing activity.

Extending the coverage of the 2013 NSW Business Chamber study to include advanced manufacturing, aerospace and aircraft maintenance

Catalytic impacts on technological know-how and manufacturing industry development are less easy to factor into a scenario-projection methodology such as the Deloitte study used. This study is likely to have under-estimated the potential catalytic effect of the airport, by not being able fully to consider the potential stimulus to engineering design, manufacturing and maintenance activity generated by:

- The economic contribution of a changing general aviation (GA) sector;
- The emergence of new wet-lease, charter fleet management and shared ownership arrangements;
- The global business jet market;
- R&D links.

To these can be added:

- The potential to create an Asia-Pacific aviation training hub for both flight training and maintenance across the GA-RPT (Regular Public Transport)-Defence spectrum, and
- Capacity-building for precision aircraft component manufacture and maintenance.

Until the airport is built, the main source of such evidence must come from case studies of existing airports. We next summarise a number of such studies, and the extent to which they included maintenance and manufacturing impacts.

2) Overseas evidence of the benefits of airports and related industries

Case studies - airports

We begin with four studies by Joakim Karlson et al. (2008) as examples of good airport impact assessments. These used a range of methodologies and all indicated significant positive impacts:


In summary, the studies sought to quantify total economic impacts, measured through jobs, wages and business sales or non-profit organisations' annual budgets. Some focused on personal spending and tax impacts, tracking these through the economy. They identified:

- Airport-dependent impacts (business activity that would cease to exist or suffer substantial loss without the airport) and
- Spin-off impacts (the recycling of dollars through the economy, often calculated using impact multipliers or by estimating induced and catalytic effects).
Regional impact was defined as the net amount of dollars remaining in the local economy, based on economic activities that would not have taken place without the local airport.

- Direct impacts were variously defined as local spending by visitors and airport tenants (including non-aviation-related businesses located on airport property), as direct employment in jobs based on airport activity, and as including both on-airport impacts that would not occur without the airport (e.g., airlines and FBOs) and off-airport direct impacts such as off-site visitor spending.

- Indirect impacts were variously defined as the value of off-airport businesses that, if the airport closed, would lose revenue, lay off workers, or relocate out of the area, and as the employment created by the purchase of goods and services by firms dependent on airport activity.

- Induced impact was defined as the multiplier effect of re-spending of the direct impact, and as the number of jobs created throughout the regional economy as a result.

- Related employment was defined as arising from the role of the airport as a catalyst for economic development.

- Tax impact—tax payments to the state and local governments by both firms and individuals involved in providing services in support of airport activity.

More sophisticated studies also assigned a dollar value to quality of life impacts such as the direct impact of recreational flying, ballooning, search and rescue work and so on, and included opportunity costs and adverse impacts.

The Michigan study, for example, found that the airport provided 450 jobs, off-airport business activities supported 4,021 jobs, and total economic impact accounted for 7,400 jobs in the region.

As well as the studies reviewed by Joakim Karlson et al (2008), a fifth US study can be cited:

_Phoenix Arizona - Sky Harbor International Airport, Phoenix Deer Valley Airport, Phoenix Goodyear Airport, Sky Harbor Center (SHC)_

In 2013, Phoenix Arizona International Airport was ranked as the world’s 27th busiest in terms of passenger movement and 13th busiest in terms of aircraft movements (ACI, 2014). The WP Carey School of Business at Arizona State University conducted an impact assessment of the three airports in 2007 and in 2011 repeated the study, adding in the impact of the new Sky Harbour Centre, a business complex developed on airport property. An input-output analysis was used, based on three indicators – payroll, employment and economic activity (revenue, sales). The study assessed direct and multiplier impacts using Department of Transportation administrative statistics and surveys of employers, travellers, aircraft owners, and airport contractors. It found that despite the severe impacts of the 2007 downturn, the airport complexes in 2011 had an average throughput of 1,266 per day, generating:

- Direct employment of 111,000, evenly split between aviation work and travel/tourism work, $5b payroll and economic activity valued at $14b.

- Indirect impact on employment, payroll and economic activity more than double the direct impact, with multipliers of 2.16, 2.2 and 2.03 (these estimates are seen as conservative);

Economic activity generated by the airport had an effect on a wide circle of communities, and created employment is a wide range of industries, in order:

- Transportation Services (28,000);

- Business Services; Government (including Public Education); Finance & Real Estate; Hospitality Services; Manufacturing; Health & Private Education (each between 10,000 and 20,000);
Retail Trade, Cargo & Warehousing; Wholesale Trade; Personal Services; Arts & Entertainment; Information & Publishing; Construction (each between 1,000 and 9,999) and Agriculture & Mining (275).

These studies were of whole-airport impacts. There are also case studies available of the economic impact when an aerospace manufacturer sets up a new facility at an airport.

**A Manufacturing example: Impact of an Original Equipment Manufacturer and maintenance provider: Savannah Airport Corporation and Gulfstream**

This case study illustrates how the Savannah Airport Corporation laid the foundation for ongoing employment generation by attracting business jet manufacturer Gulfstream, and supporting its growing global market share, with a global network of parts supply.

- In 2006, with the support of the Savannah Airport Commission in Georgia, Gulfstream began a long-term expansion plan. It created a $300m general aviation maintenance facility, linked to facilities for manufacturing, aircraft painting and R&D. The initial development added 1,100 jobs to the local economy.
- In 2010, halfway through the original seven-year commitment, with $400 million already invested and 1,500 new jobs created, Gulfstream invested a further $500m in opening a new plant on the same location designed to create a further 1,000 jobs, a 15% increase.
- By 2014, despite setbacks, the company had created 2,500 more jobs, completed two new engineering buildings at its R&D Center, a new facility for flight-test operations, expanded maintenance and overhaul facilities, and facilities for 400 new staff in its Information Technology Center of Excellence.
- In 2014 the company began building a Product Support Distribution Center near its Savannah headquarters, due to open 2015, that will employ 300 and consolidate the hub of the company’s worldwide material distribution departments.

**Spin-off and catalytic effects**

According to University of Georgia economist Jeff Humphreys (cited by Markiewicz, 2010), ‘The aerospace and aircraft manufacturing industry tends to create permanent, well-paid jobs that become ‘ingrained’ in the state’s economy. Such positions have a higher job-multiplier effect’.

As an example of spin-off effects on other industries, Gulfstream is building a new paint manufacturing facility and high-tech paint hangar near its current maintenance building on the property of the Savannah/Hilton Head International Airport. This will create 100 jobs for the area, and in the short term also have flow-on effects on employment by the Kentucky-based construction firm doing the work, as well as catalytic (spill-over) effects on productivity through innovation in painting techniques.

Gulfstream’s contributions to the education sector include the following:

- A 15 year partnership with Savannah Technical College, through which 400 students have become Gulfstream employees; and donation of a retired aircraft and components for use in degree, diploma and certificate training in aviation maintenance and diploma and certificate programs in aircraft structural technology;
- Active participation in careers days for local schools;
- Collaboration with Flightsafety International to provide e-learning based FBO handling training, designed to reduce incidence of damage during on-ground movement of aircraft.

The business jet case cited here is only one example of a wider principle. Despite some volatility, the business jet market has continued to grow (Gibbens, 2010), with customers in Europe, Russia, China and India and a global parts supply network. An estimated 1,700 private jets flew into Davos in January 2015 for the climate change talks (Hutchinson and Thornhill, 2015)! Business jets are part of a growing industry of charter, leasing, fleet management, shared ownership and fixed base
operations. The model, however could apply equally to production initiatives that build on innovations, for example in helicopter manufacture and maintenance, or in component production such as 3D printing.


**Economic impacts of airport-linked maintenance and manufacturing capacity: Innovation hubs and skill ecosystems**

It can be argued that the contribution of a Second Sydney Airport to RPT, freight, General Aviation, aircraft maintenance, aviation training and Advanced Manufacturing will have a ‘ripple’ or catalytic effect on aviation productivity with a state-wide and national dimension.

For example, an Oxford Economic Forecasting (2006) study estimated that overall, the catalytic effect of air transport usage across Europe over the previous decade had been to increase European GDP (gross domestic product) by approximately 4%. Whilst the growth had occurred partly through the impact of air transport on trade, and tourism, the more important impacts were the catalytic effects on business investment and the underlying productivity of the European economy. The Oxford study projected a further contribution of 1.8% to GDP growth by 2025.

**Aviation Valley, South-Eastern Poland and Aviation/Aerospace Australia**

An example from Poland illustrates the benefits of collaboration in a regional innovation system. In Poland, the Aviation Valley Association was formed in 2003, as a non-profit organisation with the objective of accelerating the development of the aerospace industry in the region. It was able to attract significant funding from leading engine-making OEM Pratt & Whitney, and has since attracted the participation of OEMs such as Agusta Westland and Sikorsky. With a current membership of 125 organisations, the Association aims to:

- Create a low cost supply chain of reliable sub-contractors,
- Foster aerospace research and skill formation in order to improve the manufacturing base,
- Attract foreign investors and protect aerospace businesses,
- Influence government economic policy towards the aerospace industry and its domain, and
- Develop a relationship with other European centres of the aerospace industry (Aviation Valley, 2013).

A new Australian body, Aviation/Aerospace Australia, has been formed with the objective of raising the Australian industry’s profile through trade missions and a presence at airshows and skill expos. In May 2014 it signed a Memorandum of Collaboration with Aviation Valley (Aviation Valley, 2014). This is a potential avenue for building ties, and a model for shaping the network of organisations listed in Tables A2.1 and A2.2 below into an innovation hub.

**3) Strong existing networks as the basis for a Western/Southwestern Sydney aerospace hub**

Western and Southwestern Sydney, if teamed with complementary developments in other Australian states, could provide an Australian version of the aerospace hub model. There is room for Australia. As Dr Ian Thomas, President of Boeing Australia South Pacific notes (Thomas, 2013), in integrated global supply chains, nimbleness is rewarded and Australia is ‘in there with a chance’, because the key challenge is ‘not big beats small but quick beats slow’, based on the integration of R&D with manufacturing in a design/make/deliver model. In developing automation, biomaterials, nanotechnology, robotics, molecular precision, flexible fabrics, micro production, and the creation of light cheap high quality parts, Australia has a solid future and ‘can compete in the Asian century’. 
A Second Sydney Airport will be well positioned to make a catalytic contribution to Australian GDP, if it is constructed to integrate advanced aerospace manufacturing capacity with capacity for aircraft and component maintenance, and contribution to the training and development effort that will be required to ensure that the supply of cutting-edge maintenance and engineering skills keeps pace with growing and changing demand.

Tables A2.1 and A2.2 show that already in Western and SW Sydney there is a large network of aerospace manufacturing, MRO and aviation-linked business. A major Second Sydney Airport, in conjunction with existing airports in Western and Southwestern Sydney and the Illawarra, and at the mid-point of a Defence axis from Williamtown to Nowra, could be the hub of an aircraft maintenance and aerospace manufacturing industry across RTP, GA, business jets, helicopters and Defence.

**Table A2.1 Air Operator Certificate Holders in West and Southwestern Sydney**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Also performing maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charter</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Helicopter</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Flight training</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Aerial Work</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Freight</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Business jet</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Balloon</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34</strong></td>
<td><strong>6</strong></td>
</tr>
</tbody>
</table>

Sources: CASA (2014); Sydney Metro Airports (2015)

Table A2.1 focuses on the smaller-scale fabric of General Aviation that is also part of the Western/Southwestern Sydney aviation landscape. It classifies the activities of 34 Air Operator Certificate (AOC) holders linked primarily to Bankstown and Camden Airports. Only operators of regularly scheduled passenger or cargo flights or emergency airlifts are required to hold AOCs. The list does not include Defence or most non-scheduled General Aviation (GA) flight operators, let alone recreational flying in aircraft lighter than those used in GA. Sydney Metro Airports (2015) notes that Bankstown and Camden airports host 250 ‘aviation, aviation related and other commercial and non profit organisations’: its website lists a further 21 Class B air operators. So Table A2.1 understates the demand for aircraft maintenance.

Table A2.2, shows that the aviation landscape stretches from GA to advanced aerospace. It indicates that in 2014 there was a strong nucleus of 90 MROs, maintenance training organisations, aerospace manufacturers, and aeronautical engineering firms in Western and Southwestern Sydney:

- 8 GA air operators performing maintenance in-house, for other air operators, or as their main business, and a further 5 needing an AOC for the purposes of flight training, or AOG (aircraft on ground) work (Tables A2.1 and A2.2);
- 8 firms mainly providing maintenance, parts procurement or specialist equipment manufacture to Defence, as well as other of other OEMs, MROs, logistics and manufacturing firms undertaking both Defence and civilian work but included only once to avoid double-counting.
- 13 third party MROs working across the aviation sectors, some performing specialised maintenance such as re-painting, engine rebuilds, avionic upgrades, aircraft refitting and ‘authorised person’ redesign approvals;
- 19 organisations carrying out MRO operations on fixed and rotary wing aircraft or components in the GA sector;
• 4 branch offices of large OEMs (Original Equipment Manufacturers), including a subsidiary of Airbus/Eurocopter who also carried out significant deep maintenance Defence work and Aviall, a supply chain manager of Boeing parts.

• One of only seven Maintenance Training Organisations (MTOs) in Australia holding CASA Part 147 approval to provide licence category and subcategory training. Padstow TAFE had Part 147 Category training approval, as did a second MTO close by at Nowra — Aerospace Training Services (which had a training contract with Jetstar). In addition, four MROs and OEMs had Part 147 approval to provide type rating training for specific aircraft, and two flight training organisations carried out in-house maintenance, one in GA, the other with Part 147 approval to provide type rating training.

• 5 companies were engaged in the sale of GA aircraft and the supply of aircraft parts, and include a logistics manager for Airbus and Jaguar.

• 19 manufacturing and engineering firms and 8 professional services firms, fostering participation in an increasingly knowledge-intensive global economy.

Western/Southwestern Sydney is the location of 13 out of the 146 MROs and OEMs in Australia with CASA Part 145 approval to carry out maintenance on regularly scheduled passenger- and freight-carrying aircraft. It is home to 4 of the 35 firms and engineers in Australia authorised under CASR 21M to approve the design of aircraft modifications. Padstow TAFE and ATS Nowra, along with the 5 flight training providers in the region, could form the nucleus of a Pacific training outreach, and in conjunction with Tamworth TAFE, service a wider spectrum of category and type training than Padstow’s traditional focus on Qantas apprentices allowed.

Thus, removing the double-count of 6 AOC holders listed in both Tables A2.1 and A2.2, it is possible to identify 130 firms in Western and Southwestern Sydney that are part of a potential aerospace and aviation hub. Whether they remain in their existing locations, transfer to a new large Second Sydney Airport or expand across several sites, the new airport could contribute to the development of:

• Runways capable of accommodating larger aircraft and curfew-free turnaround maintenance
• R&D and testing facilities for both civilian and Defence OEMs/components manufacturers
• A means of closing gaps in local aeroskills training and developing training exports.
Table A2.2 Maintenance Repair and Overhaul (MRO) Organisations, Maintenance Training Organisations, Aerospace Manufacturers and Aeronautical Engineering Service Providers, Western/Southwestern Sydney.

| Aviation Organisation Type | #   | Main Activities and authorisations                                                                                                                                                                                                                          | Examples                                                                                     |
|----------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air Operators              | 6   | 5 Class A Air Operator Certificate (AOC) holders (Regular Passenger Transport), 1 Class B (non-RPT) operator                                                                                           | Aust Aerial Surveys, NP Aviation, Corporate Air Careflight                                     |
| Defence Contractors        | 9   | 5 system integrators, engineering designers, testers, 2 component manufacturers, 1 Original Equipment Manufacturer also performing deep maintenance, 2 parts sourcing/supply | Aerospace and Defence Products, Airbus/Ausaero, Flite Path, Kellstrom Australia, Mostyn Enterprises |
| Third Party Maintenance, Repair and/or Overhaul (MRO) organisations | 15  | 6 whole aircraft MRO (3 Part 145 AMOs, 2 Part 147 type training MTOs, 1 Authorised Person approving modifications), 4 component repair/overhaul specialists (1 AOC holder, 3 Part 145 MROs, 2 Part 147 type training MTOs, 1 Authorised Person approving modifications), 1 providing through life support for OEM, 3 making/assembling and installing parts, 1 parts sourcing/supply/aircraft on ground (AOG work) | Aeromil, Action Tooling Services, Bilyara, Byron Aviation, Dasy, Hawker Pacific, Safran Group |
| GA-specific MRO providers  | 21  | 6 whole-aircraft MRO (1 Part 145), 13 component MRO (2 Part 145), 2 providing through life support for OEM                                                                                          | Bankstown Aerospray, Ashton Aviation Services, East Coast Propellers, John Cameron, Rotorpower Holdings |
| Original Equipment Manufacturer | 5  | 2 also Part 145 AMOs (one also Part 147 approved type training), Parts logistics/supply chain                                                                                                           | Airbus Group Australia Pacific, Aviall Australia, Goodrich Aerospace                          |
| Aviation Services          | 8   | 3 aircraft sales, ownership broking, leasing, 5 parts sourcing, logistics                                                                                                                             | Bellinger Instruments, Delta Aviation Services, Platinum Helicopters                           |
| Aerospace-linked manufacturing and engineering | 21  | 5 component manufacturers (one also MRO), 3 manufacturer of tools, systems, processes, 1 manufacturer of aerospace grade metals, composites, 12 Tier 1 or Tier 2 manufacturers                                                                 | Broens, CST Composites, Frofresh, Quickstep, Rohde & Schwarz, Thyssen Krupp |
| Education/Training         | 4   | 1 Maintenance Training Organisation – Part 147 category training*, 3 commercial pilot training (one also providing type training), 2 GA flight training providers (also AOC holders)                                         | SWSI Padstow TAFE, CAE, Clamback & Hennessy                                                   |
| Professional Services      | 10  | 8 Design, modification approval, testing, calibration (4 Authorised Persons), 2 Audit                                                                                                               | Memko, Altilus, CoaX Helicopters                                                             |
| Total                      | 102 |                                                                                                                                                                                                                                                               |                                                                                              |
The proposed location of the Second Sydney Airport is strategically located to enable such an aerospace hub to function as the nexus of several state-wide aspects of aviation and aerospace manufacture:

- The aviation operations of the various Defence arms (Fairbairn, Nowra, Glenbrook, Richmond)
- Civilian aircraft maintenance, component supply chains, flight and maintenance training, and freight operations with links to Albury, Canberra and Goulburn; the Illawarra, the state’s west and northwest, the Hunter, and the Moorebank intermodal freight terminal.

Without detracting from the operational integrity of Sydney Mascot and metro airports, and in addition to its RPT functions, the new Second Sydney Airport could be a dedicated centre for the development of advanced helicopter, business jet and GA design, manufacture, testing, as well as providing line maintenance and AOG services without curfew restrictions, specialist component maintenance, repair and overhaul, selected aircraft heavy maintenance and rebuilding, and a vibrant skills development program.

4) Indications of need and opportunity

At present, third-party maintenance operations at Mascot, particularly for GA, helicopters and business jets, are constrained by space, scheduling, curfew and cost structures. The current Sydney Airport Masterplan 2013-2033 (SACL, 2013: 34) reports that in late 2012, at Mascot there were 34 international, six domestic and six regional airlines operating, together with at least 146 transport and freight handling and forwarding companies and 346 general aviation operators. The Plan reports (p. 52) that in the 10 years to 2011, annual GA movements at Mascot remained at a steady average of around 21,000 per year, and annual helicopter movements at Mascot dipped to 5,500 per year in the 5 years to 2011 but subsequently rose.

The Sydney Airport Master Plan suggests that helicopters could better operate from the CBD, most GA movements could better operate from Bankstown and that ‘RAAF Base Richmond should be developed for non-core civilian use, including specialised freight, general aviation, helicopters and other aviation activities (SACL, 2013:52). In interviews and a survey undertaken by the authors of the present report, however, informants commented that a decline in the volume of air operators and MROs at Bankstown Airport over the past 20 years may have been linked to prohibitive cost structures and contract clauses.

This apparent focus on Mascot as a RPT centre is different from that in the recently-approved Brisbane Airport Master Plan (BAC, 2014) for ‘a premier gateway airport and a major multimodal transport hub’ (p. 21), acting as a focus for national and state economic activity. The Brisbane Master Plan cites absence of a curfew as a drawcard, particularly for freight and freight forwarding (p. 50), and assumes that growth of the FIFO workforce will be ongoing. Although Archerfield is seen as the main GA airport, it makes provision for expanded GA operations and business jet services (p. 70). The plan includes the use of two new areas within the precinct for the ‘housing, servicing, maintenance and repair of aircraft’, and for ‘associated training and education facilities’ (pp. 77-8; 83). The Brisbane plan makes explicit provision for

- a wide range of industry and business uses, including clean low impact industry research and technology facilities, knowledge creation and entrepreneurial activities and service industries that are more compatible with urban areas (p. 85).

This integrated approach is rather different from that outlined in the Sydney Airport Master Plan. The most recent Bankstown Airport Master Plan (BAL. 2014), released after the announced decision to proceed with the Second Sydney Airport would be developed, assumes that Bankstown will remain Sydney’s main GA airport, but foreshadows a Non-Aviation Development Concept more intensive and extensive non-aviation land use, with leases to other industrial and logistics businesses.
These gaps in the capacity of either Mascot or Bankstown to function as the sort of nimble innovation hub envisaged by Thomas (2013) point to the wide spectrum of aviation and aerospace activities that need to be planned for the Second Sydney Airport. Moreover, capacity to carry heavy and wide wingspan airliners is likely to be required. Airbus identifies the Sydney region, with over 20,000 long-haul passengers per day and Melbourne, with over 10,000 long-haul passengers per day in 2013, as among the world’s 42 mega-cities. It projects that by 2033, there will be 91 mega-cities and that Sydney will have 50,000 long-haul passengers per day, while Melbourne, Brisbane and Perth will move into the over 20,000 per day category (Leahy, 2014).

It is important therefore that planning for the Second Sydney Airport include an integrated approach to long- and short-haul RPT, GA (including corporate jets and helicopters) and freight. Moreover, if it is to fulfil its potential to become an innovation hub, it must plan accommodation for maintenance and its management, inspection and auditing; for the integration of aircraft and component design, reconfiguration and manufacture; and for the logistical facilities allowing OEMs to operate nimble supply chains, transshipping parts and AOG services and engaging in the rapid manufacturing processes needed to turn R&D into delivery contracts; as well as creation of state-of-the-art maintenance training facilities serving the Pacific region.

Three case studies provide examples of the types of activities that need to be expanded and planned for.

**Case Study 1 – The Second Sydney Airport as a potential cradle for innovation.** CoaX Helicopters Parramatta has designed a revolutionary range of new small format, easy-to-fly Coaxial Rotor Systems helicopters for Australian and overseas markets. Having developed complete working prototypes, they are seeking support to manufacture, market and distribute them, as well as developing a further range of UAS and pilot operated helicopters with one, two and four seats, in combustion engine and possibly electric motor configurations. The technology is new: a tail rotor is replaced by a coaxial main rotor, which the designers claim will provide more lift and a better power to weight ratio, improving stability, manoeuvrability, quietness, range and safety and decreasing running costs. Pilot training, they claim, will be much simpler, taking less time and money to complete. CoaX Helicopters plans to provide finance and leasing services, after-sales service and management of the pre-used helicopter market. The company is seeking investors.

**Case Study 2 – A GA component MRO that has grown through process improvement.** Bilyara is an aviation consulting firm at Bankstown that has diversified since its creation in 1989, into divisions providing engine overhaul, engine and engine component inspection and repair, scheduled engine maintenance and fault diagnosis, and other whole-aircraft deep maintenance projects involving inspections, overhauls and modifications. As well, another division provides sales and support of high technology radar, navigation and aerial mapping equipment; complex project management and subcontracting in Australia and overseas; and advanced technology design, development and maintenance, for example for the mining industry. This is an example of a company that has applied the expertise developed in each project to growing and diversifying.

**Case study 3 – An innovative Advanced Manufacturer.** Quickstep Holdings at Bankstown Airport, with offices in the US and Germany, is an advanced manufacturer of carbon fibre composites for the defence, aerospace and automotive industries. It has developed and patented a Resin Spray Technology, used in supplying vertical tail spars to the US Defence Department for the F-35 Lightning II Joint Strike Fighter (JSF) program and wing flaps to Lockheed Martin for the C-130J Hercules. Partnering with Northrop Grumman and Airbus/EADS, it has produced spars and wing skins for large Defence and commercial aircraft. Following a $1m federal government development grant, in April 2014 Quickstep signed a 14 year agreement with Marand, valued at $139m, to manufacture about 700 sets of carbon fibre composite parts for the JSF. This involves integration into a global supply chain involving Marand, BAE Systems in the UK, and Lockheed Martin in Fort Worth, Texas. With further government support in July 2015, Quickstep sold its process technology to ORPE Technologiya to develop a satellite heat shield. In October 2014, Quickstep entered into an agreement with US-based Vector Composites for the lease of a Quickstep curing machine,
enabling Vector Composites to manufacture composite parts in-house using Quickstep technology, and providing Quickstep with access to a US facility with reduced operating costs. In January 2015, Quickstep signed a technology transfer agreement with Thales and the first commercial Quickstep Process plant was opened in Munich. In February 2015, Quickstep gained Nadcap accreditation for quality assurance, increasing its opportunity to win new contracts from Airbus, Boeing and other manufacturers who require Nadcap accreditation throughout their supply chain (Quickstep Technologies, Newsletters and Quarterly Reports 31/1/2014; 1/4/2014; 15/07/2014; 2/10/2014; 27/1/2015; 26/2/2015).

5) Overseas studies: Government start-up support essential, but repaid in revenue returns.
While Quickstep’s success was made possible by several government grants, the revenue stream and export earnings created by the long-term contracts signed to date are valued at many multiples of these grants. Similarly, the impacts cited in Section 2 above were all made possible by government support, and all provided positive revenue returns to government.

- The Phoenix Arizona Sky Harbour International Airport was a government business enterprise that paid its own way, with sources of revenue (airline, cargo and FBO fees and rents; terminal concessions, parking and other revenues) being expended on an equivalent value of supplies, materials, utilities, payroll, contractual and other services. The 2011 impact assessment included an estimate that directly and through flow-on effects, the airports were generating $4m pa, in local and state tax revenues (WP Carey School of Business, 2012).

- The Savannah/Hilton Head Airport example also indicated the importance of government funding support and the positive returns on such investment. The Savannah Airport Corporation operates the airport on behalf of the City of Savannah. Because of the wider economic benefit to the State, in 2010 the State Government offered Gulfstream $29.65 million in statutory incentives such as sales tax exemptions, quality jobs tax credits, Quick Start training and jobs tax credits. Government support included assistance in developing the runway capacity required. But the return also produced a further multiplier effect. State development officials estimated the net fiscal impact of the project to Georgia at $65.4 million over 10 years in current dollars (Markiewicz, 2010).

- Within the Asia-Pacific region, Australia is operating in a context where governments, such as in Malaysia, have supplied very significant levels of infrastructural support in order to support Entry Point Projects designed as catalysts to stimulate the growth of a MRO and aerospace industry.

- The international legal practice Norton Rose conducted its fourth global transport survey in 2013, with over 1,000 respondents across aviation, rail and shipping. The survey responses indicated that demand for additional and new airport capacity was intensifying. 83% of global aviation respondents believed government investment in infrastructure to be ‘essential’, while only 33% believed the levels of such support would be adequate over the next five years (Poland, 2013). This suggests that a competitive advantage can be gained in areas where government steps in with infrastructural support.

6) Conclusion
Thus it is possible to identify existing aviation businesses in Western and South Western Sydney, who potentially form the basis for a thriving aviation hub. With the aviation industry rapidly expanding and a projected global shortfall in the supply of MRO services, the governments of other countries in the region are factoring aviation and aeronautical services into their modernisation plans, including R&D planning for a post-oil aviation future, and for incorporating ‘internet of things’
technologies into component stress diagnosis. For example, Boeing Research & Technology-Australia has a highly productive 23-year relationship with CSIRO. Projects to date include a world first ‘earth to engines’ biofuel study Flight Path to Sustainable Aviation, which indicated that use of biofuels in aviation could cut Australia’s reliance on fuel imports by $2 billion and greenhouse emissions by 17%: paving the way for the development of a new industry of benefit to regional and rural Australia (Thomas, 2013).

Australia’s strong aviation history and safety record make this country an attractive proposition for investment in specialised aircraft manufacturing and maintenance, other things being equal in terms of government infrastructure support.

The development of the Second Sydney Airport is an ideal opportunity for integrating, from the early planning stages, the development of a state of the art aviation and MRO hub, bringing together specialised services and advanced solutions; engine overhaul, aircraft reconfiguration, and linked to advanced manufacturers in a supply network. The foundations already exist, through firms supplying:

- Aviation services - sales and through-life service (TLS) of aircraft and equipment; fleet management linked to the provision of leasing, charter broking, fixed base operations and handling
- Aviation-related professional services (R&D, design, approval and modification of aircraft; maintenance management, safety auditing, weighing, and non-destructive testing),
- Recognised maintenance training for Asia Pacific MROs (expanding and developing the well-equipped Padstow Aeroskills RTO facility and that of ATS Nowra) and flight training providers
- Third Party MRO services, ranging from specialist overhaul, non-destructive testing, depainting and repainting, and interior refurbishment and avionics upgrades, to cone-to-tail maintenance operating independently of OEMs
- AOG (aircraft on ground) services, ferrying parts or carrying out on-the-spot repairs – for example repairs to composite structures after weather damage or an on-ground incidents, accompanied by the requisite NDT (non-destructive testing)
- Defence contracting and procurement, including R&D
- Specialised advanced manufacturing materials, tools and components
- General Aviation maintenance services for the increasingly diverse range of fixed wing aircraft including turbo-props and business jets (including long-range), and to the the large helicopter sector
- Tie-ins with OEMs (Original Equipment Manufacturers) involving subcontracts for ongoing maintenance as part of TLS (Though-life Support) services
- R&D for a post-oil aviation future and solutions to emerging requirements such as recycling management (including the unsolved issue of the green disposal of composites).
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