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Building a Local Defence Industry: Workforce Requirements 2006-2010

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Director's Note

Welcome to the twentieth issue of *Economic Issues*, a series published by the South Australian Centre for Economic Studies as part of its Corporate Membership Program. The scope of Economic Issues is intended to be broad, limited only to topical, applied economic issues of relevance to South Australia and Australia. Within the scope, the intention is to focus on key issues – public policy issues, economic trends, economic events – and present an authoritative, expert analysis which contributes to both public understanding and public debate. Papers will be published on a continuing basis, as topics present themselves and as resources allow.

The authors of this paper are Michael O'Neil (Director), Edwin Dewan (Research Economist) and Steve Whetton (Senior Research Economist), SA Centre for Economic Studies.

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Michael O'Neil
Executive Director
SA Centre for Economic Studies
March 2007

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Building a Local Defence Industry: Workforce Requirements 2006-2010

Overview

> "Defence and industry will need to develop, in partnership with the tertiary sector, a long-term plan to deliver sufficient numbers of skilled people into defence industry if we are to sustain our capacity for self-reliance. The alternative is a progressive run-down in the capability of defence industries to support our national sovereignty".[1]

The awarding of the Air Warfare Destroyer (AWD) contract to South Australia, following on from earlier successes in the construction of the Collins class submarine at the ASC Osborne precinct, has created an air of excitement and expectation regarding the burgeoning defence sector in South Australia. Both contracts create a demand for skilled labour, specifically because of the "capital and skill intensive" nature of defence programs, products and services.

South Australia's recent success in the awarding of defence contracts is significant for other reasons, principally because these large contracts provide the platform for the future development of a *local defence industry* and to take advantage of the major policy shift in defence procurement.

A new strategic approach to defence industry policy is now in place with the objectives to:

- build Australian industry capability, including greater industrial self-sufficiency;
- support local acquisition complemented by imports;
- increase self-reliance in defence supply and support;
- reduce the cyclical "boom/bust" or peaks and troughs of defence procurement to support sustained capital investment, innovation, the development of complex equipment and new technology and strengthen workforce capability.

The new policy framework seeks to align industry capability with defence strategy and increase local content through all phases of construction, maintenance, repair/refit to sustainment over the life of defence equipment purchases.

One objective of the new policy framework ─ increasing self reliance, and thereby strengthen national capability ─ is that this will enable over time, local capability to compete in the global defence supply network.

There is now greater openness and transparency on the part of Defence as they endeavour "to signal" to local defence companies the capability requirements Defence is seeking and the opportunities that are available to industry. The Defence Capability Plan (DCP) released by the Defence Materials Organisation (DMO) signals to industry the acquisition and sustainment expenditure by five sectors[2] anticipated by Defence out to 2016.

The Defence Capability Plan specifically includes reference to the development of capability in small and medium sized enterprises as well as opportunities for the larger, defence prime contractors. It is anticipated that up to 40 per cent of in-country expenditure or upwards of $A20 billion will "flow directly or indirectly to small to medium enterprises".[3]

Defence industry policy, or aligning defence strategy with industry ***capacity*** and ***capability*** contains a third component. That component is workforce development where the supply of skilled workers for employment in defence contractors/suppliers is now more critical than before. The imperative to develop a more highly skilled workforce and to increase the supply of skilled workers across all occupations is all the more challenging as demographic change impacts on the size, skill composition and experience of the workforce. That is to say, tight labour markets and a scarcity of skilled labour are likely to be more pronounced in the future which is why planning and action is required now.

To implement this new strategic approach to defence industry policy will require additional skilled workers into the industry, the up-skilling of existing employees, a workforce that is supplemented by overseas skilled migration and retention of overseas students trained in Australia and finally, improvements in the quantity and quality of courses/skills training. Specialist courses will be required to meet the needs of the defence industry and the high degree of specialisation within the industry (e.g., marine engineering, systems engineering and communication systems).

New postgraduate programs such as the Master of Marine Engineering supported by the Defence Material Organisation's Skilling Australian's Defence Industry Initiative will become a feature of our local universities. The Centre for Defence Communications and Information Networking (CDCIN) at the University of Adelaide and the Centre of Excellence in Defence and Industry Systems Capability (CEDISC) at the University of South Australia will provide further opportunities to acquire relevant qualifications for employment in the defence industry as well as support research and development. A feasibility study is currently being finalised with a view to the location in Adelaide of Cranfield University's Defence College of Management and Technology. If approved it is likely that Cranfield will offer professional short courses for the defence and security industry and Master degree courses. This development is another example of the necessary partnership between industry, universities and government to build the skills base of a defence industry.

The Maritime Skills Centre at Osborne is to provide an education hub for trade and technical skills to support the naval shipbuilding program and up to ten trade schools to be established in South Australia represent additional elements of the new infrastructure to customise training and facilitate labour market adjustment.

South Australia is challenged by the awarding of the contracts to design and build the Collins Class submarines and the Air Warfare Destroyer project. The challenge is that these contracts represent the "end of the beginning"[4] where building a defence industry into the future is the real task. A highly skilled

defence industry workforce to support a naval shipbuilding and sustainment (repair, refit, etc.) industry is an important component of that challenge.

This paper presents an overview of recent research undertaken by the South Australian Centre for Economic Studies, with the principal objective to aggregate and quantify current workforce capabilities and identify workforce requirements for the South Australian Defence Industry.[5] The paper has three components. We commence with a brief snapshot of planned expenditure within the defence sector outlined in the Commonwealth's Defence Capability Plan out to 2016. The plan includes annual expenditure on new projects as well as on-going service and sustainability of defence capability. The paper then examines current employment in major defence contracting companies in South Australia, their first and second tier suppliers and growth projection out to 2010. The potential labour supply to the defence sector from tertiary education providers is discussed before concluding, with a consideration of issues relevant to workforce planning and future challenges for South Australia.

Introduction

It is generally acknowledged that there are four specific areas within the defence industry in which South Australia has existing or emerging capabilities and each of these are considered in detail in the Defence Capability Plan 2006-2016. [8] These include the:

- maritime sector ($650m, peak 2011-12, 11 per cent);[9]
- electronics ($2b, peak 2011-12, 46 per cent);
- land vehicles ($300m, continuing to rise post 2011, 10 per cent); and
- aerospace ($1.3b, peak 2011-12, 26 per cent).

The Defence Capability Plan anticipates $5 billion annual expenditure on defence acquisition projects out to 2016 and the four capability areas above account for 93 per cent of planned expenditure each year (with weapons and munitions the remaining 7 per cent). On closer analysis the critical determinant of current capability in which South Australia has a strong competitive edge is the electronic systems element. Major acquisitions lie ahead and include, the Air Warfare Destroyer ($4.5 to $6 billion), amphibious ships ($1.5 to $2 billion), aircraft acquisitions (including the Joint Strike and heavy transport aircraft worth more than $18 billion), as well as equipping the Hardened and Networked Army ($1.5 billion). In addition, Defence is outsourcing most of its combat support, facilities maintenance, and IT and communications to the private sector.[10]

... SA ... capability in R&D, engineering and electronics to support a defence industry ...

Thus, while recent attention has focussed on the marine platforms following ASC's success in securing the AWD contract to construct the vessels, the defence sector extends, *inter alia*, to aviation, land vehicles, systems integration and services, surveillance and radar systems, simulation and training systems, communication systems and related infrastructure. There is a significant research and development sector supporting the industry in South Australia, including the DSTO, Universities (e.g., Centre of Excellence in Defence and Industry Systems Capability [CEDISC]), CRC's and the RAAF at Edinburgh. Related and supporting industries include precision engineering, metal fabrication, electrical and electronic systems, IT and software systems, testing services to name only a few. BAE Systems contract to manage the Woomera launch and test site is one component of the emerging aerospace industry.

... adjusting to the demands of an emerging industry ...

The important point here is that South Australia is embarking on the difficult and challenging task of developing a relatively new industry and employment sector. It is a task that involves the restructuring of industry, the location of new firms to take advantage of new opportunities, the re-orientation of existing firms to become involved with defence and structural adjustment in the labour market. New skills and new qualifications are required (Box 1) just as was the case with the

establishment and growth of the automotive industry in South Australia or when shipbuilding was a major part of the economy of Whyalla.

Box 1

Building a strong industry workforce is not some short-term response to skill shortages, that may arise due to variations in the business cycle. Rather, it is premised on an understanding of structural change in an economy, change in economic, social and industry policy, a realisation and response to changing demographic and labour market conditions and a response to new technology and the forces of globalisation. Demand led training is now the focus of training effort. Training courses need to be associated with job-specific experience and linked to job opportunities. The Maritime Skills Institute, new courses for defence related occupations in the VET sector and universities are examples of new infrastructure to support the advanced level of skills and capabilities required for employment, productivity and industry competitiveness. Skills development is essential for industry development.

It is this realisation that stimulated an examination of current employment in defence related firms in South Australia, anticipated growth in defence employment out to 2010 and whether tertiary institutions were responding to the emerging needs of the defence industry.

... high proportion of more highly skilled workers ...

Competition for skilled labour across the professions and trades is currently very strong, particularly in commercial electronics and the mining sector. This is particularly relevant for defence firms because a very significant proportion of the defence labour force is drawn from those with professional, administrative and management qualifications (and experience) and skilled tradespersons. It is also a fact that the defence industry has a higher proportion of highly skilled workers when compared to the State's employment profile.

Estimating Workforce Requirements in the Defence Industry

The Centre undertook a survey of major defence companies ("prime defence contractors") and first and second tier suppliers. The survey was not an exhaustive list of "all defence companies or all possible contractors/ suppliers", but was sufficiently representative of the defence industry to identify trends, issues and developments within the defence sector particularly labour force and training requirements. Moreover, the survey only sought information on the South Australian operations of each company.

The labour demand survey asked questions relating to employment for the years 2006, 2007 and 2010, specifically:

- actual employment as at June 2006;
- forecast employment as at end 2007; and
- forecast employment as at end 2010.

The data set on occupations were coded into 4-digit Australian Standard Occupational Classification (ASCO) under broad titles of manager, professionals, associate professionals, trades and related workers, clerical workers, production and transport and labourers and related workers.

Based on survey data, the total number of direct employees in those defence companies surveyed as at June 2006 stood at 5,800.

Table 1 shows current employment in the companies surveyed, the share of total employment in 2006 by broad occupational categories, estimated employment numbers to 2010 and the relative share of employment by 2010 at the ASCO one digit level.

Table 1
Current and Future Employment: Number and Share, ASCO 1 Digit

	2006		2010	
ASCO	**Number**	**Percentage Share**	**Number**	**Percentage Share**
Managers and Administrators	983	17.0	1,080	15.1
Professionals	2,883	49.7	3,382	47.2
Associate Professionals	535	9.2	684	9.5
Tradespersons and Related Workers	840	14.5	1,389	19.4
Production and Transport Workers	80	1.4	106	1.5
Clerical, Sales, Service Workers	333	5.7	385	5.4
Other Workers	142	2.4	142	2.0
Total	5,796	100.0	7,168	100.0

Note: Percentage share calculations involve small rounding factor.
Source: SACES Survey 2006.

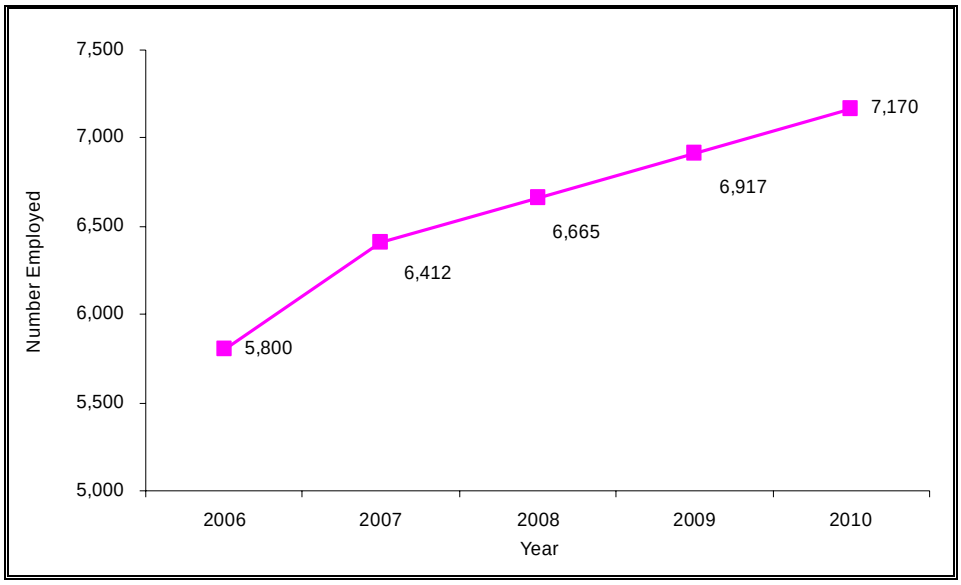
... require professional and trade qualifications ...

Almost 50 per cent of the current defence sector employment was classified as professionals (see Table 1), comprising mainly Architects, Engineers, Systems and Software Designers, Programmers and Business Professionals such as accountants, analysts, and project planners. A further 24 per cent were associate professionals and tradespersons, employed as Associate Engineers, Computer Technicians, General Mechanical and Fabrication Engineering Tradespersons, Electricians, Electronics distributions tradespersons, etc. Managers and administrators accounted for 17 per cent of all employees.

Growth in direct employment is shown below and illustrated in Figure 1:

- current employment (2006): 5,800
- employment by 2007: 6,412 (↑ 612)
- employment by 2010: 7,170 (↑ 1,370 from 2006).

Figure 1
Direct Employment: Defence 2006-2010



Note: Direct employment in 2008 and 2009 were interpolated for purposes of illustration.
Source: SACES 2006.

... 5.4 per cent growth out to 2010 ...

Out to 2010 the current workforce is expected to grow by approximately 24 per cent at a compound average growth rate of 5.4 per cent per annum. Table 2 shows the growth rate of employment or strength of demand will vary by occupational groupings and is strongest for the trades. Placing an estimated 5.4 per cent average growth rate in an historical context, it is significant to note that the growth in total employment in South Australia in the 10 year period 1995-96 to 2005-06 was only 1.3 per cent and for Australia it was 1.9 per cent.

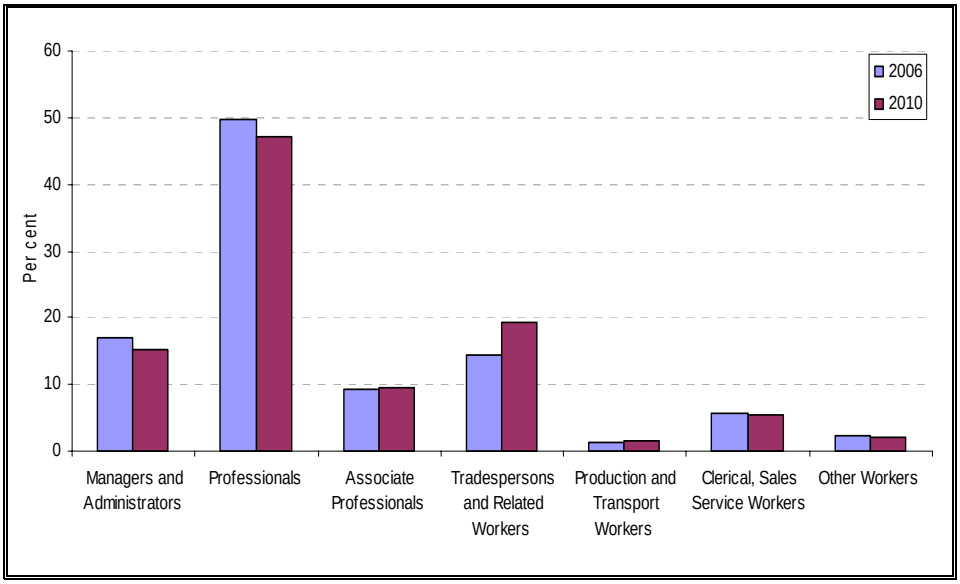
Table 2
Summary Statistics: Defence Sector 2006-2010

ASCO	Percentage Change 2006-2010	Compound Average Growth Rate
Managers and Administrators	9.9	2.4
Professionals	17.3	4.1
Associate Professionals	27.9	6.3
Tradespersons and Related Workers	65.4	13.4
Production and Transport Workers	32.5	7.3
Clerical, Sales, Service Workers	15.6	3.7
Other Workers	-	-
Total	23.7	5.4

Source: SACES 2006, calculations.

To understand the dynamics of defence industry's workforce requirements it was considered important to assess whether the profile of employment in those companies surveyed is anticipated to change over time. Figure 2 depicts the proportion of employment by occupational categories in 2006 and in the future (out to 2010).

Figure 2
Proportion of Employment By Occupational Categories Current and Expected (ASCO 1 Digit)



Source: Defence Industry Survey, SACES 2006.

profile of the workforce

It is evident from Figure 2 that the profile of the workforce in the defence industry is not likely to change significantly over the next four years. However, the share of tradespersons will increase and we sought detailed information on the types of trade qualifications expected to be in demand. In addition, there are obviously new skills/new occupations in demand as a result of the AWD contract, particularly experienced workers in the maritime industry (e.g., naval architects). In the first few years many of these skilled and experienced workers will be sourced from interstate and overseas.

When compared to total employment in South Australia by occupational categories, the profile of employment in the defence sector is heavily weighted to professionals and managers and administrators (see Table 3), those who possess a tertiary qualification and/or significant experience in the workforce.[16]

Some 67 per cent of the workforce in the defence industry survey are classified to managerial and professional occupations, compared to 27 per cent of employed persons in South Australia and 21 per cent for the mining industry.[17] Similarly, the survey results indicate that the defence industry employs a slightly higher proportion of those with a trade qualification.

Further detail on the current workforce profile and future demand for skills in the defence industry by major occupational categories is considered below.

Table 3
Employment by Occupational Categories:
South Australia and Defence Organisations, 2006

ASCO	Total Employed: SA		Defence Organisation	
	Number	Percentage Share	Number	Percentage Share
Managers and Administrators	64.4	8.6	983	17.0
Professionals	139.4	18.6	2,883	49.7
Associate Professionals	92.8	12.4	535	9.2
Tradespersons and Related Workers	93.3	12.4	840	14.5
Production and Transport Workers	75.0	10.0	80	1.4
Clerical, Sales, Service Workers	211.0	28.1	333	5.7
Other Workers	73.8	9.8	142	2.4
Total	749.7	100.0	5,796	100.0

Source: ABS, *Statistic*, August 2006. SACES.

Managers and Administrators

The defence companies participating in the survey employed approximately 983 personnel as managers and administrators, of which 14 per cent were general managers and company executives. Most (39 per cent) were technical managers involved directly in project design, construction and production/manufacturing. Employment in this occupational category is expected to increase by 10 per cent by the year 2010, with consistent growth over the next four years. Those with engineering design and construction backgrounds were identified as the growth occupations.

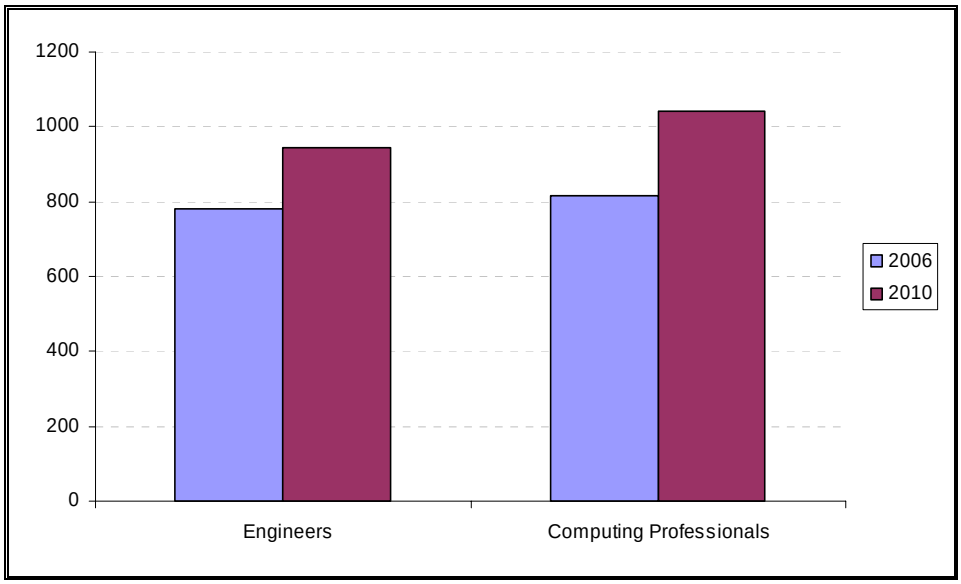
Professionals

... demand for marine engineers, marine architects, computing systems engineers ...

The respondents employed 2,883 professionals as at June 2006. Approximately 28 per cent were computing professionals; specialist building and engineering professionals accounted for 27 per cent of employees, and business and other professionals accounted for remaining 45 per cent.

Over the next four years little change was expected in the profile of professional workers. The share of employees in the defence workforce classified as professionals is expected to be relatively stable, although the number of professionals is expected to rise by 17.5 per cent out to the year 2010. Over the next 4 years, the demand identified by respondents was for computing professionals and engineering professionals. Figure 3 illustrates the current and projected number of engineering and computing professionals.

Figure 3
Number of Engineering and Computing Professionals



Source: Defence Industry Survey, SACES 2006.

Associate Professionals

... addressing demographic change ...

In mid 2006, defence companies employed 535 Associate Professionals mainly as electrical, electronics and mechanical engineering associates and technicians; computing support technicians and other associate professionals such as technician officers and business associate professionals. Included in this group are Senior Technical Officers who often have a trade background and have moved within the company into management and supervisory positions. They are now a group of older workers, nearing retirement who possess a deep institutional or corporate knowledge of the organisation and who act as mentors/trainers of young tradespersons. They are described by the companies as "having a trade background, and with extensive years of service have moved into supervisory positions running workshops, installation teams, production facilities and the like".

The growth rate in this occupational category is expected to be 6.3 per cent over the four years to 2010 although the share of total employment will increase only marginally (from 9.2 to 9.5 per cent).

Tradespersons and Related Workers

As at June 2006 respondents employed 840 tradespersons and related workers. Around 40 per cent of these workers were electrical and electronics tradespersons, 34 per cent had a mechanical engineering qualification and 14 per cent are fabrication engineering trades-persons. The remaining 12 per cent were classified as other tradesperson and include operators, refrigeration and airconditioning mechanics, painters and plumbers.

By the year 2010, the number of tradespersons and related workers is expected to increase by 65 per cent at a compound average growth rate of 13 per cent. The growth will occur across all trade categories shown in Table 4.

Table 4
Number of Tradespersons Current and Expected
(Major Occupations only)

Occupations	Number of Workers	
Tradespersons	**2006**	**2010**
General Mechanical Engineering	111	192
Metal Fitters and Machinists	49	56
General Fabrication Engineering	46	79
Structural Steel and Welding	45	73
Electricians	274	388
Electrical Distribution	29	69
Electrical Instruments	33	94
Communications	14	17
Other	239	421
Total	840	1,389

Source: Defence Industry Survey, SACES 2006.

Estimating indirect impacts

The Centre developed an Estimation Model 2006 for this study, to estimate from the forecast expansion of the defence sector by the companies in this survey, the following:

- the estimated gross employment impact in South Australia out to 2010; and
- an estimate of the gross requirement for VET Qualified Personnel. This is a measure of the secondary requirement outside (or following from) the expansion of defence manufacturing.

The model predicts that there will be a significant increase in employment across the South Australian economy as a result of the expected growth of defence manufacturers out to 2010 totalling 3,870 persons (see Appendix A, Table A.1). The employment growth is concentrated in manufacturing (60 per cent). Much of this growth is in up-stream manufacturers suppling the defence sector with inputs to production.

This employment growth scenario assumes that the employment market is elastic. In other words that there are sufficient people not currently in employment whose skill levels, work experience, age and health would allow them to enter the jobs created, to fill the vacancies (or that immigration could fill the gap). Moreover, these estimates are based on historical patterns of both consumption trends, and particularly on the extent to which inputs to production are sourced in South Australia.

The expected demand for VET qualified personnel is spread reasonably evenly, with greatest demand for those in business service and skilled manufacturing occupations as shown in Appendix A (Table A.2). The additional requirement from the VET sector will be 730 persons out to 2010.

Estimating Labour Supply

The second component of the study was concerned with an assessment of the supply side, principally through the output of the higher education and post secondary training sectors. There is no "one to one" matching of labour supply and labour demand side as businesses do not always recruit locally, they may prefer to recruit experienced workers rather than new graduates; as well, graduates are mobile and may move interstate or overseas, they may already have employment so they do not enter the pool of readily available labour, and so on.

... education and training providers are responding ...

The Centre approached the three Universities (University of Adelaide, University of South Australia and Flinders University) and TAFE SA for information on recent graduates and current enrolment numbers in engineering, IT/computer science, mathematics and related programs and the trades to provide an indication of the supply of graduates with the appropriate qualifications required by the defence sector. The educational institutions were provided with a template[21] to generate the following specific information:

- Number of graduates in 2005 – 2006 period.
- Number of enrolments in 2006.
- Duration of the program (time taken to complete each program on full-time basis).
- New programs to be offered in 2007.
- Medium term expectations on enrolment levels for the listed programs.

TAFE SA: Enrolments and Graduates

Following the awarding of the AWD SEA 4000 contract, the Department of Further Education, Employment, Science and Technology (DFEEST) in 2005 identified the following courses as being relevant to shipbuilding, maintenance and repair and all are relevant to employment in the defence sector:[22]

- Airconditioning & Refrigeration
- Electrical
- Electronics
- Fabrication and Welding
- Marine Construction
- Mechanical
- Plumbing

In 2005, some 2,267 students graduated in these courses with certificate, diploma and advanced diploma qualifications. At present, a further 8,350 students are enrolled in these courses and about 2,413 are expected to graduate in 2006 (refer to Table 5).

Table 5
Actual and Projected Graduates: 2005 and 2006

Program	Number of Graduates	
	2005 (Actual)	2006 (Projected)
Advanced Diploma (Engineering and Computer Science)	73	84
Diploma (Engineering, Computing/IT, Quality Management and OHS)	306	250
Certificate IV (Engineering, Computing/IT and Transport & Distribution, OHS)	315	360
Certificate III (Engineering, Computing/IT and Transport & Distribution, OHS, Construction and Plumbing)	1,136	866
Certificate II (Engineering, Computing/IT and Transport & Distribution)	437	853
Total	2,267	2,413

Source: DFEEST and SACES 2006.

Advanced Diploma Holders

Seventy three students achieved an Advanced Diploma in 2005. Approximately 300 students were enrolled in Advanced Diploma in mid 2006 with a new program in Civil Engineering (Structural Design) commencing this year. The number of graduates in 2005, current enrolments and projected graduation in 2006 are summarised in Appendix B, Table B.1 with a minimum of 84 graduates expected in 2006.

Diploma Holders

In 2005, there were 306 students who received a Diploma completing studies in programs related to the defence sector. At present, some 894 students are enrolled in a Diploma level program with a projected 250 students to graduate in 2006, but higher graduations in prospect in late 2007 due to an increase in enrolments in 2006 (see Appendix B, Table B.2).

Certificate IV

Three hundred and fifteen persons successfully completed Certificate Level IV, mainly in IT/computing and engineering field. Some 78 per cent of these graduates attained a qualification in Information Technology, specialising in areas such as programming, network management, systems analysis and design.

In mid 2006, 1,100 students were enrolled in Certificate IV level programs that are relevant to employment and the requirements of the defence industry (see Appendix B, Table B.3). Higher graduate output is forecast in 2006 following an increase in enrolments in 2006.

Certificate III and Certificate II

In 2005, 1,140 students attained a Certificate III level qualification, while in 2006, some 3,290 students were undertaking Certificate III level program. The number of graduates in 2006 is estimated at 866, but will

increase thereafter following an increase in enrolments (refer to Appendix B, Table B.4).

Approximately 440 students graduated with Certificate II level qualification in 2005. In 2006, some 2,765 students were enrolled for Certificate II level studies. Slightly less than two-thirds (66 per cent) of the students are undertaking Introductory Vocational Education.[23] A substantial increase in the number of graduates completing Certificate II courses is anticipated following higher enrolments in 2006 (see Appendix B, Table B.5).

... developing a hub for training courses at Osborne ...

In summary, the trend is for an increase in both enrolments and graduations from the technical and vocational sector in courses relevant to employment in the defence sector. In addition to current enrolments the Maritime Skills Centre, a purpose built facility for skills development of the ASC shipbuilding workforce will provide an important hub for trade and technical courses for naval shipbuilding, repair and maintenance. Up to $10 million has been allocated for workforce development programs. This is significant as those with a trade qualification and experience in the workforce are forecast to be in strong demand.

University Enrolments and Graduates

In 2005, 1,351 students graduated with undergraduate or higher qualifications from the University of Adelaide, Flinders University and University of South Australia relevant to employment in the defence industry. The number of domestic students who graduated ─ *those who are Australian citizen or permanent resident of Australia* – was 767. The actual numbers by qualification were as follows (with anticipated graduations of domestic students in 2006 shown in brackets):

- 601 undergraduate (631);
- 44 postgraduate/certificate/diploma (46);
- 95 Masters degree (100); and
- 27 Doctoral degree (28).

Undergraduate Degrees

In total, 601 students attained an undergraduate degree in 2005. Moreover, 4,089 students are currently enrolled in an undergraduate degree majoring in Engineering and IT/Computer Science (see Table 6). Automotive engineering is a new course first offered in 2006. Overall, enrolment numbers have gradually increased for domestic students and show a strong increase for international students, many of whom would be eligible for a work visa or permanent stay in Australia following graduation.

Table 6
Number of Graduates and Enrolments in Undergraduate Degree

Program Name	2005 Graduates	Number of Students Enrolled in 2006		
	Domestic Students Only	Domestic	International	Total
Aerospace Engineering	5	151	17	168
Automotive Engineering	-	67	8	75
Bachelor of Information Technology	50	198	70	268
Bachelor of Nanotechnology	23	74	9	83
Chemical Engineering	35	161	75	236
Civil, Structural and Environmental Engineering	69	351	167	518
Computer Systems Engineering	88	390	140	530
Software Engineering	17	178	36	214
Computer Science	132	300	241	541
Electrical and Electronics Engineering	46	240	125	365
Mechanical Engineering	68	442	146	588
Mechatronic Engineering	33	202	53	255
Telecommunications Engineering	18	53	40	93
Petroleum Engineering	12	101	43	144
Other	5		11	11
Total	**601**	**2,908**	**1,181**	**4,089**

Note: The figures include Bachelor degree, Honours degree, and double degree.
Source: University of Adelaide, University of South Australia and Flinders University 2006.

Postgraduate Certificate/Diploma

There were 44 domestic students who graduated with postgraduate certificate/diploma qualifications in 2005. It is the assessment of the course co-ordinators that this group of graduates could all be readily employed in defence companies as most have a background in engineering, science and defence studies. Generally it takes between one to one and a half years to complete these programs for a full-time student. Further, as at mid 2006, there were 130 postgraduate students enrolled in a certificate or diploma program. Around 73 per cent were domestic students (see Table 7).

Table 7
Number of Graduates and Enrolments in Postgraduate Certificate/Diploma

Program Name	2005 Graduates	Number of Students Enrolled in 2006		
	Domestic Students Only	Domestic	International	Total
Graduate Certificate in Project Management	16	33	15	48
Graduate Certificate in Engineering	11	24	0	24
Graduate Certificate of Science (Defence)	1	2	0	2
Graduate Certificate in Science & Technology Commercialisation	4	1	0	1
Graduate Certificate of Business Enterprise	2	2	0	2
Graduate Diploma in Engineering	7	20	17	37
Graduate Diploma in Science & Technology Commercialisation	3	3	0	3
Graduate Diploma in Computer Science	-	3	2	5
Graduate Diploma in Mathematical Science	-	2	1	3
Graduate Diploma in Defence	-	3	0	3
Total	**44**	**95**	**35**	**130**

Source: University of Adelaide, University of South Australia and Flinders University 2006.

Masters Degree

Table 8 shows the number of domestic students who completed a Masters Degree in 2005 and student enrolments in 2006. There are three types of Masters program included in the data. That is, a Masters by Research, by Coursework and Masters by combined coursework and research. Ninety five domestic students completed a Masters Degree in the specialised fields.

... tapping into the pool of international students ...

Approximately 1,175 students are currently enrolled in Masters program, of which 44 per cent are domestic students. International students dominate course enrolments most notably in three courses ─ Master of Computer Science and IT, Master of Engineering (Manufacturing) and Master of Project Management. The dominance of international students suggests that further efforts needs to be made to understand the origin and destination of these graduates and whether they are available to work in the local defence, computer and electronics industry sectors.

Table 8
Number of Graduates and Enrolments in Masters Degree

Program Name	2005 Graduates	Number of Students Enrolled in 2006		
	Domestic Students Only	Domestic	International	Total
Master in Engineering (Computer Systems)[a]	8	257	80	337
Master of Advanced Engineering	-	1	30	31
Master of Civil, Structural & Environmental Engineering	3	21	11	32
Master of Computer & Software Engineering	-	6	15	21
Master of Computer Science and IT	11	9	134	143
Master of Engineering (Chemical)	-	5	18	23
Master of Engineering (Electrical and Electronics)	4	16	37	53
Master of Engineering (Manufacturing)	6	3	187	190
Master of Engineering (Marine)	-	7	0	7
Master of Engineering (Mechanical)	2	8	15	23
Master of Engineering (Petroleum)	-	8	14	22
Master of Entrepreneurship	9	21	0	21
Master of Project Management	29	58	98	156
Master of Science & Technology Commercialisation	11	20	1	21
Master of Science (Defence)	-	38	0	38
Other Masters Degree	12	33	21	54
Total	**95**	**511**	**661**	**1,172**

Note: [a] Includes computer systems, engineering, electrical and power engineering, microsystems technology, systems engineering, telecommunications, test and evaluation.
Source: University of Adelaide, University of South Australia and Flinders University 2006.

Doctoral Degree

There were 27 domestic students who graduated with PhD qualification, of which one third specialised in a Computer related discipline. Table 9 collates data on those attaining Doctoral Degrees in 2005 and enrolments in 2006.

In the coming years, the trend in enrolments, while expected to increase across engineering, and computer science, would still be subject to the number of Commonwealth funded places, additional grants and student preferences.

In summary, South Australian education institutions have responded to emerging demand particularly in customising courses in shipbuilding, maintenance and repair. The Universities have introduced new courses and provided additional places. Cranfield University (UK) specialising in defence education and services will collaborate with the University of South Australia and University of Adelaide to provide additional postgraduate technical training to defence sector employers. Graduate numbers are increasing; however, considerable expansion in overseas student enrolments does not automatically translate into a higher pool of graduates from which to recruit as many could not expect to obtain a defence security clearance.[26] Sustained activity to encourage domestic students to consider careers in engineering, computer science, mathematics and science will be required.

Table 9
Number of Graduates and Enrolments in Doctoral Degree

Program Name	2005 Graduates	Number of Students Enrolled in 2006		
	Domestic Students Only	Domestic	International	Total
PhD Chemical Engineering	-	30	7	37
PhD Civil Engineering	5	6	5	11
PhD Civil & Environmental Engineering	7	24	6	30
PhD Computer Systems Engineering	-	24	1	25
PhD Computer Science	-	23	5	28
PhD Electronic Engineering	4	45	2	47
PhD Electrical Engineering	3	39	9	48
PhD Information Technology	-	2	0	2
PhD Manufacturing Engineering	1	22	0	22
PhD Mechanical Engineering	4	52	8	60
PhD Transport Systems Engineering	1	8	0	8
PhD Petroleum Engineering & Management	-	8	6	14
PhD Maths and Computer Science	2	21	5	26
Other	-	17	31	48
Total	**27**	**321**	**85**	**406**

Source: University of Adelaide, University of South Australia and Flinders University 2006.

Gap Analysis

While there inevitably is some degree of uncertainty regarding the future demand for skilled labour and the supply of graduates the Centre undertook a gap analysis to assess the "situation of the defence sector in 2010". In estimating the most likely situation in 2010 the following caveats (and likely state of the labour market) were considered relevant:

- by 2010 with the expansion of the Olympic Dam site by BHP-Billiton, there will be a strong demand for those with trade qualifications and engineering/mining qualifications;
- interstate demand for skilled labour in the mining sector will remain strong;
- labour mobility will continue to be a feature of the national labour market especially for those with trade and university qualifications;
- the defence sector in South Australia will recruit experienced personnel such as naval architects for the AWD contract from overseas;
- South Australia will maintain a high and increasing number of new skilled migrants under the skilled-independent regional (SIR) visa (the share of skilled migration is now 7 per cent up from 4 per cent in 1995-96);
- other qualifications/skills in accounting, finance, commerce and human resources are required by the defence sector; and
- skilled workers will transition from other sectors of employment (e.g., automotive, whitegoods) to defence/maritime sector.

... real pressure point is likely to be demand for tradespersons ...

In 2006 defence sector firms recruited 226 university graduates. Out to 2010 new graduate recruitment is expected to gradually increase to 280 per annum to meet expansion in the industry, replacement/turnover of staff and retirement. Recruitment of tradespersons is estimated at 140 persons in 2007 and a further 120 tradespersons each year out to 2010. The projected increase in university graduations in defence related courses is sufficient to meet demand. The "pressure point" in the labour market relates to the number of apprentices in training and an increase in enrolments and graduations is required.

The Maritime Skills Centre will be critical to the supply of qualified tradespersons in electronics, welding, metal fabrication and building trades. There will be opportunities for the re-deployment and re-training of skilled workers.

Table 10
Current Recruitment 2006 and Planned

	2006	2007	2008	2009	2010
Graduates	226	237	247	258	279
Tradespersons	-[(1)]	140	120	120	120

Note: [(1)] Recruitment of new apprentices was estimated at 60 in 2006 with total employment of apprentices at 170 at various stages of their apprenticeship.

Workforce Planning

The third component of the 2006 Defence Industry Study conducted by the Centre was a series of questions, using predominantly an open ended format on workforce planning.

There were three broad sections in the workforce planning survey:

- assessment of current and additional demand for apprentices or those with a trade qualification, the recruitment of university graduates and expectations about skills/occupations in demand over time;
- recruitment priorities in the immediate and medium term, whether a company would be required to recruit from overseas, impediments to recruiting staff, and internal HR strategies to develop the workforce; and
- more general workforce planning issues in the context of the local economy, given broader demographic trends, assistance by government and industry implementing its own initiatives.

Demand for Graduates, Unmet Demand

The Number of Apprentices

Overall 44 per cent of the respondents indicated that they currently employ apprentices. In total, around 170 workers are employed as apprentices. Approximately 44 per cent of respondents reported an intention to increase their recruitment of apprentices in 2007. Allowing for some uncertainty from respondents, the Centre estimates that the demand for apprentices in 2007 from the companies surveyed, is in the range of 100 to 140 tradespersons.

... vacancies for trade and technical skills listed now ...

According to respondents, the trade or occupational areas that are expected to receive priority in 2007 include the following:

- Aircraft Maintenance Engineers
- Electrical Tradespersons
- Electronic Tradespersons
- General Fabrication Engineering Tradespersons
- IT Support Technicians
- Marine Construction Tradespersons
- Mechanical Engineering Tradespersons
- Metal Fitters and Machinists
- Motor Mechanics
- Sheetmetal Tradespersons
- Structural Steel and Welding Tradespersons

The Number of University Graduates

Most companies (76 per cent) employed university graduates in the 2005-2006 period. In total, 226 new graduates were employed by respondents in 2005-06. Additionally, 83 per cent of the respondents are currently looking to recruit graduates in the immediate future, evidence of strong demand in the current labour market.

Table 11, shows the major occupations that firms are currently looking to recruit.

Table 11
Major Occupations Firms Intending to Recruit

General Occupations	Respondents (per cent)
Engineering Professionals	73.5
Computer/IT/Software Personnel	45.1
Design/Construction Personnel	14.7
Tradespersons	35.3
Other	14.7

Source: Defence Industry Survey 2006.

Skill Shortages: Current and Future

... skills/occupations that are eagerly sought ...

Seventy one per cent of the respondents indicated that they had current skills shortages and were recruiting to address the problem and that the same skills or occupations were likely to be in short supply in the medium term. The following skills/occupations were identified as in demand now and into the future.

- Accountants
- Aeronautical Engineers
- Analysts Programmers
- CAD Designers
- Civil Engineers
- Drafters
- Electrical Engineers
- Electro Optics Engineers
- Electronics Engineers
- Estimators
- High-end Schedulers
- Logisticians
- Mathematicians
- Mechanical Engineers
- Naval Architects
- Other Computing Professional and Technicians
- Physicists
- Project Managers
- Radar, Tests and Integrations Engineers
- Software Engineers
- Statisticians
- Structural Engineers
- Systems Engineers

Most respondents emphasised that they face difficulties recruiting experienced professionals, and in some areas personnel with defence related experience where a security clearance was either difficult to obtain at all or very slow to obtain.

With regards to tradespersons, one third of firms stated there was a shortage of workers with specific trade qualifications/skills. In particular, respondents identified current shortages in the following skills/occupations and indicate this situation was likely to persist in the medium term:

- ASLAV qualified mechanics/fitters
- Boilermakers
- CNC Machinists
- Diesel Mechanics
- Electricians
- Electronic Instrument Tradespersons
- Metal Fitters and Machinists
- Sheetmetal Tradespersons
- Structural Steel and Welding Tradespersons
- Technicians

Demand for Labour (Short and Medium Term)

Approximately three quarters of the respondents expect to recruit additional staff in the short-term (within 6-12 months).

Moreover, some 15 per cent of respondents indicated they are likely to employ through interstate and overseas migration and specifically the skills sets, experience and qualifications most eagerly sought relate to expertise in shipbuilding and marine electronic installation.

Most respondents emphasised that they intend to recruit experienced professionals with a Masters or higher level qualification and there is activity underway to secure experienced naval shipbuilding experts from Europe and the USA. However, they also stated that overseas recruits will need to be able to obtain the appropriate security clearance.

Table 12
Strategies Respondents Plan to Adopt to Ensure Sufficient Supply of Skilled Labour

Strategy	Respondents (Per cent)
Upskill existing workers	95.4
Recruit and train new staff	95.1
Work closely with education and training providers to source workers	48.8
Improve productivity	39.0
Introduce new technology	36.6
Increase use of contractors	36.6
Rely on migration	14.6
Increase or change shifts/rosters	14.6
Other	14.6

Source: Defence Industry Survey 2006.

Some 61 per cent of the respondents mentioned that they were currently experiencing impediments to recruiting staff. The main types of impediments were issues pertaining to security clearances process, availability of highly skilled personnel and higher wages as a result of both inter and intra industry competition. Notwithstanding, listed in Table 12 are the strategies indicated by defence firms that they intended to adopt to ensure they had sufficient supply of skilled labour to meet demand over the next 5 years.

Conclusion

... government, industry and education providers collaborating ...

South Australia is 'building the platform' for the development of a vibrant and expanded local defence industry. An important component of the defence industry is the high proportion of skilled and qualified workers within the industry, which implies that the tertiary education sector has a vital role to play in building the capability of the industry. Already it is possible to identify supply side responses with the development of new courses, the establishment of Centre's of Excellence to support R&D, the involvement of international universities (e.g., Cranfield, Carnegie Mellon) and the purpose built, vocationally oriented Maritime Skills Centre. Collaboration with industry is a feature of several of the developments referred to here.

The defence industry workforce is expected to grow strongly out to 2010 (and beyond). Direct employment in core defence firms is currently 5,800 persons. By the year 2010, direct employment in the defence industry is projected to increase by 24 per cent to about 7,200. In terms of future workforce requirements it is apparent that companies not currently located in South Australia may be attracted to locate as a result of the AWD contract, other defence work and growth in this sector over time, and are likely to spur further demand for skilled labour.

... a flexible policy mix ...

To cater for higher demand for skilled workers, a flexible policy mix is required with the intention of attracting skilled interstate workers and overseas migrants and more importantly developing the local skill base. Retraining for retrenched workers is an obvious priority.

The defence workforce is "knowledge" based and strongly biased toward high skill levels. Given this profile, the industry will continue to demand skilled workers with Bachelor or higher qualifications and those with Certificate III or IV qualifications and relevant work experience.

... creating a skills revolution ...

It is estimated that direct employment in the defence industry of 7,200 by 2010 will be approximately equivalent to that of direct employment in the mining sector of 7,600 by 2010. On current estimates, direct employment in the mining sector could peak around 2011-2012 with 9,000 employees. The Centre's estimate for the defence sector of 7,200 direct employees by 2010 is a conservative estimate, so it is most likely that defence, the mining industry and sustained employment growth in electronics and ICT will be at the forefront of the "skills revolution" and the necessary productivity gains in the South Australian economy.

This highlights the strong demand for skilled tradespersons in the South Australian economy in the very near future, that the lead or preparation time is right now and the important role that the vocationally oriented Maritime Skills Centre is expected to play in training for defence skills.

... continue to emphasise science and mathematics ...

University places are available to increase the pool of engineering, technology and computing graduates. However, in medium to longer term greater emphasis on science and mathematics in the secondary schools also require attention.

If there is not to be a shortfall of graduates it is imperative that the vocational sector does achieve an increase in the rate of graduates of 6.4 per cent per annum out to 2010 and the universities achieve a 5 per cent increase in graduates from those courses identified in the defence industry workforce study as defence related. Defence industry employment will need to be supplemented by skilled migrants, inter-sectoral labour flows and direct overseas recruitment.

Appendix A

Table A.1
Estimated Gross Employment Impact: 2006-2010
15 Sector Industry Model

Agriculture	56.2
Mining	10.3
Food, Beverage & Tobacco manufacturing	36.6
Textile, Clothing & Footwear manufacturing	21.2
Wood & Paper Product manufacturing	60.1
Printing, Publishing & Recorded Media	33.2
Petroleum, Coal, Chemical & Assoc. Product manufacturing	54.0
Non-Metallic Mineral Product manufacturing	15.2
Iron & Steel manufacturing	129.3
Basic non-ferrous metal & products manufacturing	20.2
Structural metal products manufacturing	25.7
Sheet metal products manufacturing	6.7
Fabricated metal products manufacturing	147.5
Motor vehicles & parts; other trans. equipment manufacturing	582.6
Ships and boats manufacturing	754.3
Railway equipment manufacturing	0.5
Aircraft manufacturing	0.2
Photographic and scientific equipment manufacturing	89.6
Electronic equipment manufacturing	74.7
Electrical Equipment & Appliance manufacturing	106.7
Industrial Machinery & Equipment manufacturing	78.8
Other manufacturing	17.3
Electricity, Gas & Water	40.2
Construction	11.0
Wholesale & retail trade; repairs	618.3
Accommodation cafes	90.4
Transport & storage	120.0
Communication Services	49.5
Finance & Insurance	88.5
Property & Business Services	251.6
Government Administration & Defence	27.8
Education	48.0
Health & Community Services	76.5
Cultural & Recreational Services	40.5
Personal & Other Services	78.6
Total	**3,862**

Source: SACES calculations.

Table A.2
Estimated Gross Requirement for VET Qualified Personnel
Secondary Impact Outside Defence Manufacturing: 2006-2010[1]

	Total	Advanced Diploma/ Diploma	Other VET
1 Managers and Administrators	73	25	49
21 Science, Building and Engineering Professionals	1	0	0
22 Business and Information Professionals	32	17	14
23 Health Professionals	1	0	0
24 Education Professionals	2	2	1
25 Social, Arts and Miscellaneous Professionals	16	8	8
31 Science, Engineering and Related Associate Professionals	23	8	14
32 Business and Administration Associate Professionals	33	13	20
33 Managing Supervisors (Sales and Service)	32	6	25
34 Health and Welfare Associate Professionals	6	2	4
39 Other Associate Professionals	9	4	5
41 Mechanical and Fabrication Engineering Tradespersons	84	3	80
42 Automotive Tradespersons	31	0	30
43 Electrical and Electronics Tradespersons	31	2	29
44 Construction Tradespersons	15	0	14
45 Food Tradespersons	14	0	13
46 Skilled Agricultural and Horticultural Workers	5	1	4
49 Other Tradespersons and Related Workers	57	3	54
51 Secretaries and Personal Assistants	10	3	7
59 Other Advanced Clerical and Service Workers	10	4	6
61 Intermediate Clerical Workers	48	14	35
62 Intermediate Sales and Related Workers	23	4	19
63 Intermediate Service Workers	24	7	17
71 Intermediate Plant Operators	14	1	13
72 Intermediate Machine Operators	13	1	11
73 Road and Rail Transport Drivers	19	2	17
79 Other Intermediate Production and Transport Workers	20	2	18
81 Elementary Clerks	4	1	3
82 Elementary Sales Workers	24	5	19
83 Elementary Service Workers	5	1	4
91 Cleaners	7	1	6
92 Factory Labourers	28	3	25
99 Other Labourers and Related Workers	18	2	16
Total	729	147	582

Note: [1] The demand for VET qualified personnel flow from the estimates of employment induced in various industry sectors as a result of the increase in defence manufacturing, and as such are subject to the same caveats regarding historical expenditure patterns. It is also worth noting that the breakdown by qualification requirements as a guide to the potential additional demand for VET qualified persons in the labour force represents, necessarily, a static view of the economy's skill requirements.

Source: SACES calculations.

Appendix B

Table B.1
Advanced Diploma Graduates, Enrolments and Projected Graduates

Program Name	Graduates 2005	Enrolments 2006	Projected Graduates 2006
Advanced Diploma of:			
- Computer Systems Engineering	11	11	
- Civil Engineering (Structural Design)		70	
- Engineering (Electrical)	9		
- Engineering (Electronic)	27	9	
- Engineering (Fabrication)		13	
- Engineering (Mechanical)	24	166	
- Engineering (Refrigeration/Airconditioning	2	28	
Total	**73**	**297**	**84**

Note: The program takes approximately 30 months to complete on full-time basis.
Source: TAFE SA 2006 and SACES 2006.

Table B.2
Diploma Graduates, Enrolments and Projected Graduates

Program Name	Graduates 2005	Enrolments 2006	Projected Graduates 2006
Diploma of:			
- Civil Engineering	10	149	
- Computer Systems Engineering	2	14	
- Engineering		20	
- Engineering (Electrical)	12	11	
- Engineering (Electronic)	22	16	
- Engineering (Mechanical)	53	196	
- Information Technology	191	362	
- Occupational Health and Safety	11	113	
- Procurement, Materials & Quality Management	5	13	
Total	**306**	**894**	**250**

Note: The program takes approximately 18-24 months to complete on full-time basis.
Source: DFEEST SA 2006 and SACES 2006.

Table B.3
Certificate IV Graduates, Enrolments and Projected Graduates

Program Name	Graduates 2005	Enrolments 2006	Projected Graduates 2006
Certificate IV in:			
- Automotive Manufacturing	6	29	
- Electrotechnology Computer Systems	3	134	
- Engineering – Higher Engineering Trade	3		
- Engineering (Aircraft Maintenance)	25	10	
- IT (Client Support)	59	111	
- IT (Network Management)	94	187	
- IT (Multimedia)		98	
- IT (Programming)	59	60	
- IT (Systems Analysis and Design)	12	15	
- IT (Tech Support, Website Admin. & Design)	22	79	
- OHS	26	268	
- Plumbing	2	47	
- Procurement Management	4	1	
- Transport and Distribution		57	
Total	**315**	**1,096**	**360**

Source: DFEEST 2006 and SACES 2006.

Table B.4
Certificate III Graduates, Enrolments and Projects Graduates

Program Name	Graduates 2005	Enrolments 2006	Projected Graduates 2006
Certificate III in:			
- Civil Construction	18	41	
- Electrotechnology	288	451	
- Engineering	245	859	
- General Construction	180	589	
- Information Technology	197	403	
- Introductory Vocational Education	35	133	
- Marine (Mechanics)	14	21	
- Marine Craft Construction		12	
- OHS	59	84	
- Plumbing (also includes Basic, roof plumbing)	94	559	
- Other	6	137	
Total	**1,136**	**3,289**	**866**

Source: DFEEST 2006 and SACES 2006.

Table B.5
Certificate II Graduates, Enrolments and Projected Graduates

Program Name	Graduates 2005	Enrolments 2006	Projected Graduates 2006
Certificate II in:			
- Electrotechnology	74	321	
- Engineering	39	56	
- Gas Operations	6	3	
- Information Technology	274	465	
- Introductory Vocational Education	45	1,823	
- Transport and Distribution		94	
Total	**438**	**2,763**	**854**

Source: DFEEST 2006 and SACES 2006.

End Notes

[1] Paul Dibb, drawn from ACIL Tasman (2004) "A Profile of the Australian Defence Industry", Melbourne, p. iii.

[2] The DCP lists acquisitions and sustainment expenditure anticipated as in-country expenditure for electronic systems, aerospace, maritime, vehicles and land and weapons and munitions. Total expenditure is estimated at $A81 billion with at least $A48 billion of in-country expenditure to 2016.

[3] DCP: Industry Capability, Defence and Industry Conference, July 2006.

[4] Mr Greg Tunney, Managing Director, ASC, November 2005 in speech to the Order of Australia Annual Dinner.

[5] The research was commissioned in 2006 by the Defence Skills Institute on behalf of Defence Teaming Centre, Defence Companies, Centre of Excellence in Defence & Industry Systems Capability (CEDISC) and the South Australia Government.

[8] Department of Defence, Defence Capacity Plan 2006-2016.

[9] Figure in brackets refer to approved annual expenditure out to 2016, the peak year of expenditure and the proportion spent in each sector. Electronics systems expenditure would be understated as it is also included in aerospace, maritime, land vehicles. Approved plus unapproved spend for acquisitions to 2016 by sector is $41b of which $16b will be spent in-country. Maritime represents $5b, Electronics $18b, Land Vehicles $3.5b and Aerospace $12b. A further $40b was estimated for sustainment activities out to 2016 with $32b estimated as in-country expenditure. Figures supplied by the Department of Defence.

[10] Source: Department of Defence, Defence Capability Plan 2006-2016 and the Committee for Economic Development of Australia Paper – "The Business of Defence Sustaining Capability" Growth No 57.

[16] According to the ASCO, Managers and Administrators and Professionals have a skill level commensurate with a bachelor degree or higher qualification or at least year 5 years relevant experience (skill level 1). Associate Professionals have a level of skill commensurate with an AQF Diploma or Advanced Diploma or at least 3 years relevant experience (skill level 2), while Tradespersons and Related Workers have a skill level commensurate with an AQF Certificate III or IV or at least 3 years relevant experience (skill level 3).

[17] "Staffing the SuperCycle: Labour Force Outlook for the Minerals Sector 2005-2015", National Institute of Labour Studies, Flinders University (2006).

[21] The Centre provided the relevant course name/title to each University and TAFE SA. The list of courses was compiled with the assistance of the higher education sector and DFEEST and was supplemented by the Centre's review of all courses offered by these education providers. The respondents were able to include any additional programs which they considered relevant to the defence industry (e.g., University of Adelaide postgraduate studies in Marine Engineering, postgraduate studies in Signal Processing) or where postgraduates were known to be employed by the defence sector.

[22] The following discussion should be taken as indicative only; it is concerned with trends in enrolments, likely graduation rates and courses which are assessed as likely to lead to employment in the defence industry.

[23] "Introductory Vocational Education courses are designed to meet the needs of a diverse group of students, ranging from young people at risk of disengaging from formal learning to the long-term unemployed, people with a disability and others with special needs, Aboriginal and Torres Strait Islanders, and those from non-English Speaking Backgrounds. The courses provide structured learning in all facets of literacy and numeracy as well as social skills development and work-readiness". (TAFE SA, 2006).

[26] We are informed that due to security clearance restrictions predominantly people from the US, UK and Canada are readily employable in the defence industry, whereas most international students come from India, China, Vietnam and Indonesia. The origin of student is unlikely to change, particularly because they are attracted to South Australian universities and are eligible for up to 5 additional points for permanent residence status. At the current time it would appear that a significant number of international students would not be eligible to be employed by defence companies, thus restricting the potential labour pool.