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The Department of Defence's Naval Shipbuilding & Repair Sector Strategic Plan

An ASPI Decision Makers' Brief

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Note: This is an updated version of an ASPI Decision Makers' Brief prepared in September 2002 on the basis of the first version of the Naval Shipbuilding and Repair Sector Plan. Since then, three further versions of the plan have been released culminating with the latest at the end of October. While the text of the plan has remained largely the same throughout, important tables and graphs have changed from version to version. This brief is based on the latest version of the plan and the detailed modelling data that has recently become available from *http://www.defence.gov.au/dmo/msd/sectorplan.cfm*.

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Introduction

This brief has been prepared to assist decision makers in assessing the Naval Shipbuilding and Repair Sector Strategic Plan prepared by Department of Defence and released by the Minister on 28 August this year. A separate ASPI Policy Report *Setting a Course for Australia's Naval Shipbuilding and Repair Sector* examines the future of the Naval Shipbuilding and Repair Sector more broadly.

Executive Summary

The Sector Plan argues that the future demand for naval shipbuilding will be insufficient to support competition and that industry consolidation is inevitable. But while it is true that spending on new construction will drop following the completion of the Collins project, spending on major surface warships will remain largely unchanged compared with the last fifteen years and an extensive program of upgrades, larger than any previous, is also planned.

Nevertheless, the Sector Plan proposes abandoning competition and restructuring the sector around a monopoly shipbuilding prime-contractor, claiming savings of several billion dollars over the next fifteen years. However, much work remains before this proposal or the prospective savings can be accepted.

Underlying the Sector Plan's claims are two critical assumptions. First, that competition would require a 67% larger workforce to deliver the same vessels than a monopoly shipbuilder, and second, that a monopoly will achieve productivity benefits almost *six times* greater than under competition. Both these assumptions are highly questionable.

The Sector Plan estimates a 26% cost penalty under the competitive model. In comparison, a RAND analysis of the UK Type-45 destroyer project concluded that competition would, as likely as not, cost the same as a monopoly (but with long-term escalating costs if competition were permanently abandoned).

There are also a number of unresolved questions about implementation. The plan provides no detail on the process by which the monopoly would be created, and the practicality of the proposed governance and contracting arrangements is unclear. The specifics of the Government's long-term commitment to the monopoly shipbuilder are also not clearly defined in the plan.

And there are risks with the proposal. A monopoly shipbuilder, with no competition and a guaranteed order book, is likely to cease acting like a commercial entity and become both bureaucratic and inefficient. And once the Government creates a monopoly shipbuilder it will unavoidably become responsible for its commercial success. This will complicate negotiations on the cost of projects and may reduce future flexibility. Another key risk is that subcontracting by the monopoly shipbuilder will become a cosy work-sharing arrangement, especially if the monopoly's proposed 'diversity of ownership' includes all or most potential subcontractors.

Finally, although the plan acknowledges problems with the current shipbuilding schedule it stops sort of providing a concrete alternative, and instead proposes that the life-of-type of naval vessels be reduced from 30 down to 20 years to provide a more continuous workload for industry in the distant future. The business case for this proposal requires rework employing real, rather than stylised, cost data before being accepted. The conclusions are highly questionable.

The remainder of this brief examines the key questions arising from the sector plan in detail.

The Naval Shipbuilding & Repair Sector Plan – Key Questions

What does the sector plan propose?

The plan argues that the future demand for naval construction will not sustain competition. The solution proposed is a single shipbuilding 'alliance entity' with a monopoly over shipbuilding prime contracts but with a high proportion of work to be subcontracted out competitively. Savings of over $2.6 billion over the next fifteen years are claimed, along with another $610 million to be saved through rationalising ship repair and maintenance. A reduction in the life-of -type of vessels from 30 down to 20 years is also proposed to ensure a more continuous workload for industry and boost the capability of the fleet.

Is industry consolidation inevitable?

The plan argues that industry consolidation is inevitable because the demand for naval construction will drop from $12 billion over the last fifteen years to only $6 billion over the next fifteen – although elsewhere in the plan the demand for new construction is assumed to be $7 billions (para 7.39). In any case, some care needs to be taken when comparing past and planned expenditure. To begin with, the $12 billion spent in the last fifteen years includes $5.1 billion for the Collins class submarine project, and there are no plans to build subs in the next 15 years. The demand for surface ship construction has only changed from $6.9 billion to $6 (or $7) billion.

And there is more to future demand than just shipbuilding. In the next fifteen years major upgrades will be undertaken on the Collins, Anzac and FFG class. Not since the mid-to-late eighties has anything close to so extensive an upgrade program been undertaken. This adds significantly to the total future demand. Indeed, the sector plan assumes expenditure of around $10.7 billion (Figure 1) on the construction and upgrade of major naval platforms. Alternatively, using the unclassified DCP, we estimate the demand to be $11.3 $\pm$ 1.2 billion. This excludes $0.85 billion to be spent on minor war vessels, and over $1.0 billion on weapons projects that include platform integration (see Annex A), both areas where major industry players actively compete. Yet even these figures still might not capture the full demand over the next fifteen years.

The sector plan used the Defence Capability Plan (DCP) as the basis for future demand. But the DCP only extends out to 2011/12, with no estimate of any projects that might arise in the five years to 2016/17. For example, no account is taken of beginning work on the new class of surface combatants that will follow on from the air warfare destroyer[1] nor of the possibility of a fourth destroyer as discussed elsewhere in the plan (Annex B para 1&2).

In any case, comparison of expenditure between past and present is not the critical issue. The fact is that all three of the major shipbuilders have large contracts to upgrade Navy vessels this decade and they show no sign of wanting to depart the sector. As future contracts are won and lost these firms will contract and expand. Some may choose to leave the business, others may seek to pool their resources. Still others may seek to enter the sector. It is true that future demand will not sustain the sector frozen in its current form, just as past demand drove the dynamic changes that shaped the industry sector we see today.

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[1] Plan Blue, Australia's Navy for the 21st Century 2001-2030, available at www.defence.gov.au.

Having asserted that there is insufficient work to support competition, the sector plan then undertakes a 'supply and demand analysis' (chapter 7). On the basis of this analysis the plan concludes (para 8.1) that demand is insufficient to support more than one shipbuilder. However, what the modelling results actually claim is that shipbuilding in a competitive duopoly costs more than construction by a single monopoly shipbuilder and that current funding levels would not cover the difference. But how reliable are the cost estimates?

How do the monopoly and competition models compare?

In the sector plan analysis, open competition is modelled by dividing the workload between two separate companies. This is then compared with having all of the work undertaken by a monopoly shipbuilder. In both instances it is assumed that a high proportion of work, including module construction, is subcontracted out.

The sector plan estimates that competition would cost an additional $2.61 billion, or 26% more, over the next 15 years compared with a single monopoly supplier. The two dominant factors behind this result are additional personnel costs of $1.63 billion and net productivity benefits in favour of a monopoly of $620 million. Reduced equipment and infrastructure costs contribute lesser savings of $170 million and $190 million respectively.

There are a host of specific assumptions in the modelling that push the costs in favour of the monopoly arrangement. Some of these assumptions are made clear in the sector plan, others can only be found by looking in detail at the numerical modelling. The two predominate factors are the assumed workforce numbers and relative productivity benefits. These are examined in detail below.

Workforce Numbers
The $1.63 billion in additional personnel costs is a direct consequence of assuming a substantially larger workforce under competition. The detailed workforce numbers used in the model appear in Annex B to this brief. These figures are based on data provided by industry stakeholders to Defence.

It is assumed that for every 100 people employed in the monopoly firm around 167 people are required under open competition. And this is *before* any difference in productivity has been taken into account. While some duplication of management and specialist personnel is inevitable, such a high level of additional staffing is very surprising.

The workforce numbers were not included for verification in the independent audit of the model by ACIL Consulting Pty Ltd. However, the credibility of the numbers can readily be judged from the data itself.

A simple credibility check can be performed as follows. Because the two competitive shipbuilders in the modelling each undertake substantially less work than the monopoly shipbuilder, the size of the monopoly shipbuilder's workforce represents an extreme upper limit on the size of their respective workforces. Indeed, aside from some management and specialist roles, the individual shipbuilders should have significantly smaller workforces. This is especially the case for construction skill sets where the size of the workforce should be proportional to the amount of work to be done.

However, as show in Annex B to this brief, there are more than one hundred instances where there are more people in a particular skill set working for one of the competitive companies than there are employed by the monopoly shipbuilder at that time. That's *more* people doing *less* work. And this includes construction skill sets where the size of the workforce should scale with amount of work being undertaken. Table 1 summarises the data in Annex B.

Table 1: Comparison of assumed workforce numbers – personnel years

Skill set	Monopoly	Shipbuilder 1	Shipbuilder 2	Shipbuilder 1 & 2	%
Program / Project Management	2220	2124	2291	4415	199%
Design	1534	905	1414	2319	151%
System Engineering	1230	837	1335	2172	177%
Engineering	1101	975	1052	2027	184%
Class, Configuration Management	998	416	658	1074	108%
Integrated Logistics Support	1240	968	1048	2016	163%
Whole-of-Ship / Platform Integration	1004	556	786	1342	134%
Quality Assurance / Control	735	413	526	939	128%
Procurement	490	408	524	932	190%
Estimating / Planning	368	402	396	798	217%
Sub-contractor Management	326	250	356	606	186%
Hull / Mechanical Construction	2410	2460	2300	4760	198%
Outfitting & Equipment Installation	6025	4361	5246	9607	159%
Test, Trials and Evaluation	639	382	462	844	132%
Training	497	341	563	904	182%
Overhead	2080	1577	1892	3469	167%
Total (personnel – years)	**22897**	**17375**	**20849**	**38224**	**167%**

	Single shipbuilder skill set with *more* personnel than monopoly
	Single shipbuilder skill set with less than 10% fewer personnel than monopoly

Productivity Benefits

Net productivity benefits of $620 million, or over 6% of the total project cost, are assumed in favour of the monopoly arrangement. This is the difference between absolute benefits of over 7% favouring the monopoly model and only around 1% favouring competition. While economies of scale and the benefits of continuity will arise in a monopoly, it is difficult to understand why the innovation and efficiency generated by competition does so little to compensate.

The specific productivity factors assumed are very revealing. The average annual benefit due to 'good governance' in a monopoly arrangement (something assumed not to be available to competitive companies) is almost three times larger than that due to the benefits of competition in the separate companies. And within the competitive companies themselves, it is assumed that the average annual *benefit* of competition is less than a quarter of the average annual *cost* of competition. And the costs involved are substantial, the cost of competition adds more than $260 million to the cost of a competitive arrangement.

As with the workforce numbers assumed in the modelling, industry stakeholders have assisted Defence with setting the parameters of the various productivity benefits on the basis of their commercial experience. Nevertheless, with almost a factor of six

greater benefits accruing to the monopoly it is difficult to understand why competition does so little to redress the balance.

The RAND Report[2]
The UK Ministry of Defence commissioned RAND to examine industry strategies for the Type 45 Destroyer project. They found that if production was allocated *non-competitively* between two shipbuilders a cost premium of 10-13% would arise compared with the work being undertaken by a single shipyard. However, if the work was allocated *competitively* between two shipyards, RAND estimated that there was roughly an even chance that competitive production at two shipyards would yield the same overall cost as sole-source production at one shipyard. It is not clear how to reconcile this with the 26% premium estimated in the Sector Plan, especially given that a single project like the Type-45 would have greater economies of scale than the three separate projects in the DCP.

The RAND report also noted that a loss of competition would likely lead to an ongoing escalation of price, and gave 1.8% per annum as an indicative figure. While this specific figure might be challenged, the long-term consequences of abandoning competition merit close examination. Ultimately the RAND report recommended an innovative approach that divided production on a module basis between two shipbuilders. This approach was accepted even though it carried an estimated 4-5% cost penalty, one advantage being that it retained the option of future competition[3].

Repair and Maintenance
The plan estimates that savings of $610 million (or 33%) over fifteen years can be achieved through rationalising the repair and maintenance sector. As with shipbuilding, the key drivers are personnel and productivity benefits, and the modeling is subject to the same uncertainties as before. Nevertheless, a more stable and longer-term approach to naval repair and maintenance is probably justified. Whether this justifies the creation of monopolies is another question.

But there is an another factor important in the case of repair and maintenance. The demand figures in the sector plan reflect approved expenditure (para 7.16) but Defence has reported elsewhere that Navy's logistic support costs are running 30% above guidance[4]. This so-called 'logistics shortfall' is acknowledged in the sector plan (para 5.13) yet no remedial action is proposed. Arguably the first step in sustaining repair and maintenance skills should be to ensure that it is properly funded.

How will the 'Single Shipbuilding Entity' Work?

What will the entity look like?
Nowhere does the sector plan provide a consolidated description of the proposed new entity, but the following can be reasonably (but not unambiguously) deduced. ASC will be a key element of the entity (para 3.13), which will have diverse ownership possibly including shareholders from the existing NSR firms (para 12.7, 12.13). The entity will probably operate a single consolidation yard with three large slipways (Table 2) adjacent to its engineering and program management site (para 1.29) which is likely to be the current ASC site (para 3.12 & 6.26).

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[2] The Royal Navy's New-Generation Type 45 Destroyer: Acquisition Options and Implications, Birkler et al, RAND publications, 2002, available at www.rand.org.
[3] Select Committee on Defence Fourth Report, *Warship Building Strategies*, The United Kingdom Parliament, available at www.parliament.uk.
[4] David Saunders, DSTO *Approaches for reducing cost of RAN operations and ownership*, http://www.ideea.com/pacific2002/program/technical/Saunders.pdf

The entity will not undertake module construction but will instead competitively subcontract module construction to other companies including its shareholders. The entity will manage all repair, maintenance and upgrade work that it will subcontract to monopoly repair entities on the east and west-coast (para 6.13).

How will the entity be created?
The sector plan provides no detail of how the 'alliance entity' will be created beyond saying that it will involve a 'structured process' that will 'engage market forces and competition processes' in 'accordance with Defence's clearly stated requirements' (para 8.26). Elsewhere, the plan argues that the sale of ASC should be the 'catalyst and focal point for the restructuring of the NSR sector' (para 3.12 & 3.13).

It is important to clarify just is envisaged by a 'structured process':

- Will the process be restricted to the current NSR players?
- How will the monopoly repair entities be created?
- What are the mechanics and timetable for the process?
- How and when will the outstanding issues with ASC (para 3.14) be resolved and how will the sale of ASC be incorporated into the process?

Most importantly, will there be a competitive process or a government facilitated consolidation? It is difficult to see how a process to consolidate the current players can be run as a competition.

Ultimately, the feasibility of the proposal depends critically on the process taken to set up the new entity. We need to be assured that there is a practical plan of action before proceeding.

How will the entity be managed?
It is proposed that the entity be a commercial body with no Government shareholding, and with a 'diversity of ownership such that no single shareholder or group is able to exert significant influence' (para 12.7). Yet at the same time the Government will have control or veto over a number of strategic and operational decisions by the entity through an alliance contract. Chapters 10, 11 & 12 of the sector plan outline the very intricate and multi-layered arrangement proposed between Defence and the sole-source shipbuilding entity. This material merits close examination before the proposal is agreed.

One risk is that the intimate, restrictive and largely exclusive relationship between Defence and the shipbuilding entity will tend to encourage the entity to behave more like a bureaucracy than a commercial company. Over time, the entity may well come to emulate Defence's efficiency and effectiveness in procurement.

Who will be accountable?
The sector plan recognises the importance of accountability in the alliance (para 11.6). But how much accountability can be expected from the sole-source shipbuilding entity under the proposed arrangements? The entity will be created for the express purpose of undertaking Defence work and is unlikely to have the financial backing to meaningfully share financial risk with the Commonwealth. With no other significant business activities, its only major asset will be its contract with the Commonwealth.

Accountability is further blurred by the fact that the entity is being created at the Governments request and will be managed with close Government oversight. Ultimately the Government will unavoidably bear responsibility for its success or failure. This will give the entity significant leverage in its dealings with Defence.

What is the extent and nature of the Commonwealth's commitment?
The extent and nature of the Commonwealth's commitment to the sole-source shipbuilding entity must be made clear. Will the entire fifteen year program of ship construction be guaranteed to the entity? What flexibility would the Commonwealth have to delay or cancel projects in response to changed strategic circumstances or technological innovation? And what will be extent of compensation payments (para 11.17) that the Commonwealth has to pay to end the alliance?

The sector plan discusses the need to periodically re-compete the role of sole-source shipbuilder (para 9.4) at around every 15 years but with other options canvassed (para 11.7). It is important to clarify exactly what scheme is proposed so that its feasibility can be assessed. The risk is that once naval shipbuilding capacity is consolidated in a monopoly entity it may be very difficult to reintroduce domestic (as opposed to foreign) competition.

Cost Control
The intimate relationship between Defence and the monopoly shipbuilder, coupled with the proposed 'design-driven' acquisition strategy, increases the risk of costly Australian-unique vessels. The 'design-driven' approach will develop designs to meet defined Defence requirements and 'ensure that Defence can influence the detailed design as necessary to optimise equipment commonality, operability and inter-operability' (para 2.10, 2.11). And notwithstanding cautionary comments elsewhere (para 4.25), the acquisition strategies in Annex B of the sector plan make no mention of using existing ship designs.

Another risk is that subcontracting will fail to deliver value-for-money. To begin with, all maintenance, repair and upgrade work will be subcontracted to *monopoly* 'repair entities' on the east and west coast (para 6.13). And despite the legalistic mechanisms proposed to prohibit the monopoly entity from favoring its shareholders (para 11.24-11.26) the commercial reality might be a cosy work-sharing arrangement, especially if the entities 'diversity of ownership' includes all or most potential subcontractors.

Can we smooth demand for naval construction?
The sector plan notes that the five to six year gaps in the schedules for the construction of the amphibious and afloat support vessels will 'have a significant impact on the sustainability of some industry-skill sets out of peak demand' (para 14.3). But the sector plan provides no alternative schedule and there appears to be no intention to address this problem in the up-coming revision of the DCP (para 14.7-14.10).

Instead, the plan proposes that the life-of-type of naval vessels be reduced from 30 down to 20 years to provide a more continuous workload for industry in the distant future and to boost the capability value of the fleet. But the supporting analysis uses stylised data that is difficult to reconcile with real-world costs. For example, the routine maintenance costs displayed in Figure 17 – 20 for a single vessel are of the same order of magnitude as the costs assumed earlier in the paper for the entire fleet (Figure 3). Before any such proposal is accepted a robust business case using actual data needs to be developed. The FFG class would be an obvious candidate given the

Navy's 20 years of experience in operating the vessels including an upgrade program of known cost.

Conclusion

The sector plan does not provide a convincing argument on why a single sole-source shipbuilding entity is necessary, or preferable to competition. And it provides little assurance that it could be managed to the Commonwealth's benefit. These issues need to be duly addressed before proceeding.

As it stands, it offers a complex and risky solution to a problem that does not exist.

Annex A

Planned Naval Shipbuilding Demand 2002/03 to 2016/17

Table 1 **Major Warship Construction & Upgrades[1]**		
Construction Projects	**Minimum**	**Maximum**
AWD	3500	4500
Tobruk Replacement	350	450
LPA Replacement	1000	1500
Replace Westralia	350	450
Replace Success	350	450
ANZAC Ship Project	817	817
New Submarine Collins	106	106
subtotal	6473	8273
Upgrade Projects		
LPA Additional Capability	50	75
ANZAC USWUP (harpoon)	134	134
ANZAC USWUP (underwater)	unknown	unknown
Collins Class Augmentation	60	60
Collins Enhancements	250	350
Collins Full Capability	350	450
Collins Improvement	450	600
ANZAC Anti Ship Missile Defence	450	600
Frigate Towed Array	250	350
FFG Upgrade	744	744
Collins Refits and Repair [2] (15 x $82.5 m)	1238	1238
subtotal	3638	4263
Total	**$10,111 m**	**$12,536 m**
Total Demand	**$11,323 m ± $1213 m**	

Notes:

1. Cost data taken from unclassified Defence Capability Plan 2001-2010 and Defence PBS 2002-03. Following Defence's methodology we have also included the submarine refit and repair demand undertaken by ASC.

2. Prime Minister's press release 16 October 2001 on 'Submarine Refits for Adelaide' said that each submarine refit costs approximately $70 million and that refits are required every seven years, this equates to $60 million per annum for the fleet. In addition, Defence advise that another $20 to $25 million per annum is spent on routine submarine maintenance undertaken by ASC. Less than $5 million per annum is actually spent of submarine maintenance undertaken by west-coast repair and maintenance firms.

3. No estimate has been made of additional projects that might arise between 2011/12 and 2016/17.

Annex A

Planned Naval Shipbuilding Demand 2002/03 to 2016/17

Table 2
Minor war vessel construction and upgrade [1]

	Minimum	**Maximum**
Survey Motor Launch Upgrade	50	75
Hydrographic Ship Upgrade	75	100
LPA Watercraft	50	75
LCH & LCM8 Replacement	50	75
Patrol Boat	350	450
Minehunter Coastal Acquisition	170	170
	$745 m	**$945 m**

Table 3
Naval weapon projects that include integration onto platform[1,2]

	Minimum	**Maximum**
Lightweight Torpedoes	250	350
Lightweight Torpedoes	200	250
Evolved Sea Sparrow Missile	250	350
Heavy Weight Torpedo	200	250
	$900 m	**$1200 m**

Notes:

1. Cost data taken from unclassified Defence Capability Plan 2001-2010 and Defence PBS 2002-03.

2. Excludes weapon projects without an integration component.

3. No estimate has been made of additional projects that might arise between 2011/12 and 2016/17

Annex B

Monopoly Ship Builder	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Program / Project Management	130	120	100	120	120	140	160	170	200	190	180	170	160	140	120	2220
Design	75	83	83	90	98	113	128	150	135	128	105	98	90	83	75	1534
System Engineering	75	70	65	75	75	80	90	90	100	95	90	85	85	80	75	1230
Engineering	68	63	59	63	63	72	81	81	90	86	81	77	77	72	68	1101
Class, Configuration Management	60	56	56	56	60	64	66	68	80	80	76	76	72	68	60	998
Integrated Logistics Support	75	70	70	70	75	80	85	90	100	100	95	90	85	80	75	1240
Whole-of-Ship / Platform Integration	60	56	52	56	60	64	72	72	72	80	80	76	72	68	64	1004
Quality Assurance / Control	45	42	39	42	45	48	51	51	54	60	60	54	51	48	45	735
Procurement	30	28	26	28	30	32	34	34	36	40	40	36	34	32	30	490
Estimating / Planning	23	21	18	21	23	24	26	26	26	30	30	27	26	24	23	368
Sub-contractor Management	15	14	14	17	15	17	23	24	26	30	30	27	27	24	23	326
Hull / Mechanical Construction	120	100	100	120	140	170	180	190	200	200	200	190	180	160	160	2410
Outfitting & Equipment Installation	300	275	250	300	325	375	450	450	475	500	500	500	450	450	425	6025
Test, Trials and Evaluation	36	30	24	30	30	33	39	45	48	57	60	60	54	48	45	639
Training	20	20	20	23	28	28	33	33	35	43	48	50	45	38	33	497
Overhead	112	105	97	111	119	134	152	157	168	172	167	162	151	141	132	2080
Total	**1244**	**1153**	**1073**	**1222**	**1306**	**1474**	**1670**	**1731**	**1845**	**1891**	**1842**	**1778**	**1659**	**1556**	**1453**	**22897**

Annex B

Shipbuilding Prime 1	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Program / Project Management	120	120	135	143	150	150	150	143	135	150	150	150	150	143	135	2124
Design	35	35	56	63	70	70	67	67	63	67	70	63	63	60	56	905
System Engineering	48	48	51	54	57	60	60	60	54	57	60	60	57	57	54	837
Engineering	56	56	60	63	63	70	70	70	63	67	70	70	67	67	63	975
Class, Configuration Management	24	24	24	26	27	30	30	30	27	29	30	30	29	29	27	416
Integrated Logistics Support	56	56	56	60	63	70	70	70	63	67	70	70	67	67	63	968
Whole-of-Ship / Platform Integration	32	32	34	36	38	40	40	38	36	38	40	40	38	38	36	556
Quality Assurance / Control	24	24	24	26	27	30	30	29	27	29	29	30	29	29	26	413
Procurement	24	24	24	24	27	30	29	29	27	27	29	30	29	29	26	408
Estimating / Planning	24	24	24	24	26	30	29	29	26	24	27	30	30	29	26	402
Sub-contractor Management	12	10	12	14	17	20	19	19	17	16	18	20	20	19	17	250
Hull / Mechanical Construction	120	100	100	120	140	180	200	190	180	180	190	200	200	190	170	2460
Outfitting & Equipment Installation	210	175	175	228	263	315	350	333	333	315	333	350	350	333	298	4361
Test, Trials and Evaluation	18	15	18	21	26	29	29	29	27	27	29	29	30	29	26	382
Training	12	12	12	15	21	26	27	29	21	24	29	29	29	29	26	341
Overhead	82	76	80	91	101	115	120	116	110	111	117	120	119	114	105	1577
Total	897	831	885	1008	1116	1265	1320	1281	1209	1228	1291	1321	1307	1262	1154	17375
New Construction																
Westralia																
Tobruk																
Success																
Manoora																
Kanimba																

	Equal to Monopoly Shipbuilder
	Greater than Monopoly Shipbuilder

Annex B

Shipbuilding Prime 2	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Program / Project Management	145	138	136	136	145	153	162	162	170	170	170	162	153	153	136	2291
Design	66	72	77	94	99	105	105	110	110	105	105	99	94	85	88	1414
System Engineering	85	80	75	80	80	95	95	100	100	100	95	95	90	85	80	1335
Engineering	68	64	60	56	64	72	76	76	80	80	76	76	72	68	64	1052
Class, Configuration Management	43	40	35	38	40	45	45	48	50	50	48	48	45	43	40	658
Integrated Logistics Support	68	64	52	56	64	72	76	76	80	80	76	76	76	68	64	1048
Whole-of-Ship / Platform Integration	51	48	39	42	48	54	57	57	60	60	57	57	57	51	48	786
Quality Assurance / Control	34	32	26	28	32	36	38	38	40	40	40	38	38	34	32	526
Procurement	34	32	26	28	32	36	38	38	40	40	40	38	36	34	32	524
Estimating / Planning	26	24	20	21	24	27	29	29	30	30	30	29	27	26	24	396
Sub-contractor Management	20	17	14	15	18	20	27	29	30	30	30	29	27	26	24	356
Hull / Mechanical Construction	130	110	90	100	100	130	160	180	200	200	200	190	180	170	160	2300
Outfitting & Equipment Installation	293	248	203	225	225	293	360	428	450	450	450	450	405	383	383	5246
Test, Trials and Evaluation	26	20	18	20	20	26	32	38	40	40	40	38	36	34	34	462
Training	25	23	23	25	25	30	43	48	48	48	48	48	48	43	38	563
Overhead	111	101	89	96	102	119	134	145	153	152	150	147	138	130	125	1892
Total	1225	1113	983	1060	1118	1313	1477	1602	1681	1675	1655	1620	1522	1433	1372	20849
New Construction																
Collins 6																
Anzac 5																
Anzac 6																
Anzac 7																
Anzac 8																
AWD 1																
AWD 2																
AWD 3																

	Equal to Monopoly Shipbuilder
	Greater than Monopoly Shipbuilder