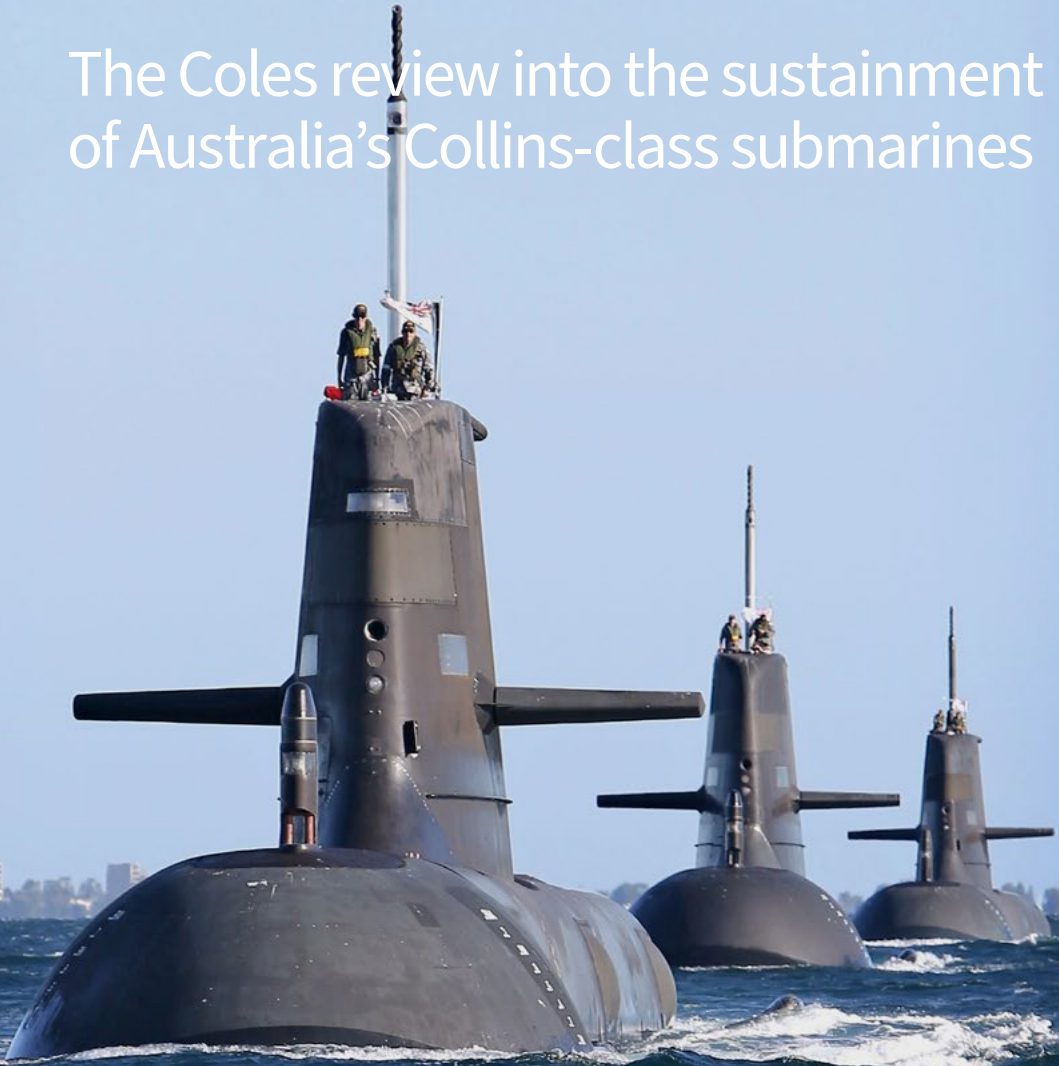


Nobody wins unless everybody wins

The Coles review into the sustainment of Australia's Collins-class submarines



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Andrew Davies

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The Coles review into
the sustainment of Australia's
Collins-class submarine

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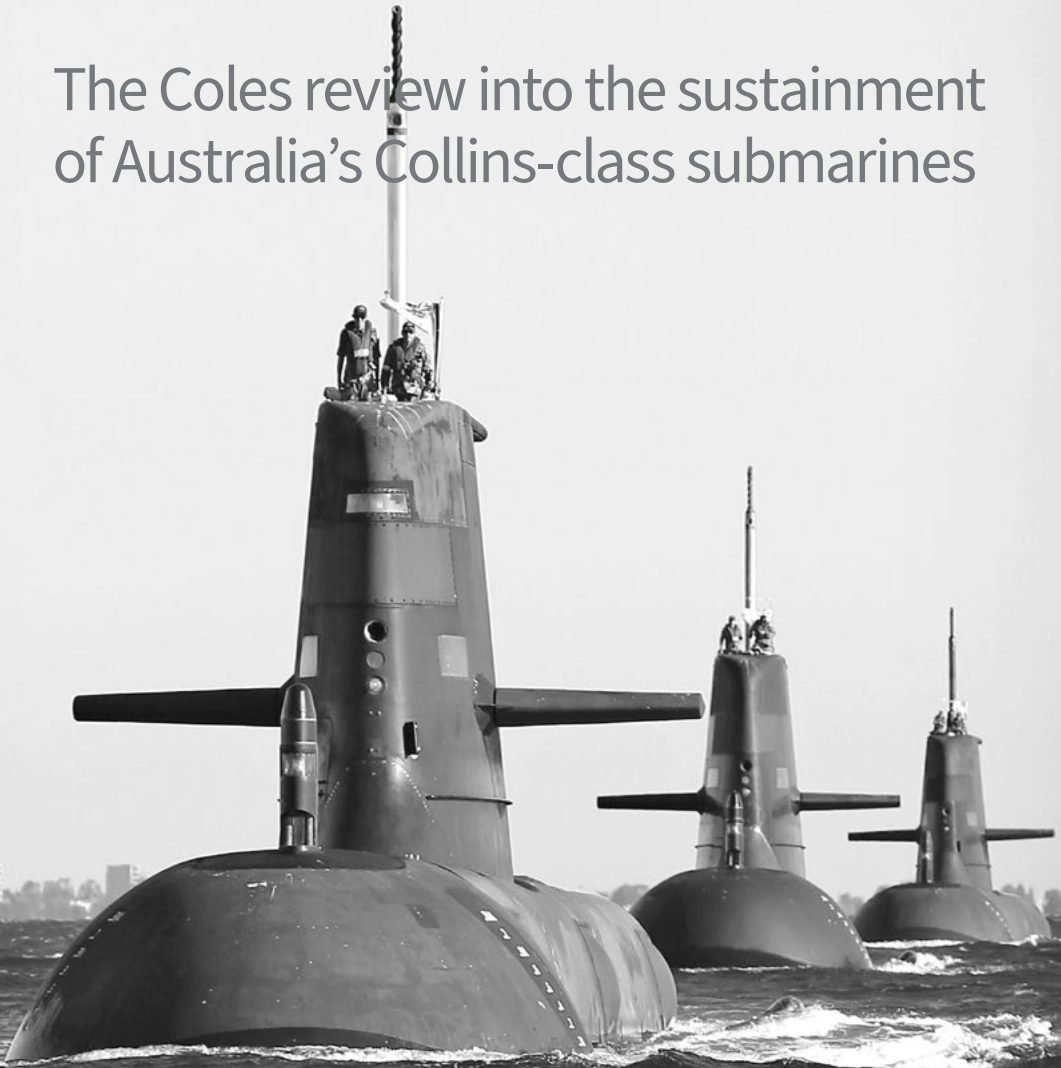
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Cover photo: The Department of Defence caption to this 2013 photograph reads 'Cockburn Sound, near Rockingham Western Australia was busier than usual as three submarines on a variety of activities were in close proximity for a short time. HMAS Dechaineux was departing for deployment whilst HMAS Waller, who recently completed a scheduled maintenance period was undertaking post maintenance trials. HMAS Sheean, who has recently returned from naval exercises on the east coast of Australia, was once again departing to conduct a variety of activities in the Western Australia Exercise Area.' The significance of this photo for the story told in this volume is explained in Chapter 5. (Photo: Department of Defence, [online](#)).

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Chapter 1: The BC (before Coles) era

A problem surfaces

On 10 June 2011, *The Australian* newspaper ran a front-page story with the headline ‘Not a single submarine seaworthy’. In that piece, defence reporter Cameron Stewart explained that the nation’s six Collins-class submarines were all temporarily out of action for various reasons, leaving the Royal Australian Navy (RAN) without a single boat that could be deployed on operations. That should have been a surprising and alarming claim about a class of boats that were only a decade old, but it was less startling to the wider public because it was only the latest in a long string of negative press reports.

The public perception of the Collins class had never recovered from the well-publicised (although often exaggerated) issues that arose during their construction in the Australian Submarine Corporation’s yards at Osborne, Adelaide. The inevitable teething issues that show up during sea trials of a new class also generated bad press. The significance of those early problems was also frequently exaggerated, but the net result was that headlines about ‘dud subs’ continued to resonate with the public long after the technical issues that spawned them had been resolved. So, another round of bad publicity about the Collins fleet was troubling for the government, playing into existing public scepticism about an important but expensive asset. In the public’s eyes, the Collins class was nothing more than an expensive flop.

Those closer to the Collins submarines knew that they were much better machines than the popular perception had it, at least when they were working as designed. The problem was that they operated as designed much less frequently than the Navy needed them to—and the trend was downwards. Things had started well enough after the commissioning of the last three of six boats from 2001 to 2003. Following a working-up period, the fleet reached a high point of over 1,400 days of availability (in Navy parlance, ‘materiel ready days’, or MRDs) in the 2005–06 financial year. Representing an average of over 200 days of readiness from each submarine over the course of the year, that was a solid return on investment. (As we’ll see later, that level of performance was well above the international benchmark standard.) But those high initial levels proved to be a false dawn and represented a high point that would take years, and the review that’s the subject of this volume, to be seen again. The figure for the following year was a little over 800 MRDs, and by 2009–10 the Chief of Navy was being offered fewer than 400—well below what was required to

meet operational planning goals, or to even provide adequate training for the crews. (The data is presented in Chapter 3.)

So, although Stewart's article propelled the issues with Collins support and maintenance into the public eye, raising the political stakes for the government in the process, it didn't come as a surprise within the Department of Defence or in the Minister for Defence's office. Signs of poor performance in the support of the Collins fleet had been obvious for several years, and many attempts had been made to get to the root cause of the problem. By some counts, there had been 18 separate inquiries, none of which had resulted in the remediation of the problem.

In principle, it shouldn't have been too hard to sort things out, as all of the major parties involved were government entities. The Australian Submarine Corporation (now ASC, and referred to as such hereafter) was responsible for the platform maintenance of the Collins boats and is owned by the Department of Finance as sole shareholder. On the Defence side, the responsible agency for managing the support contracts was the Defence Materiel Organisation (the DMO),¹ which thus acted as the agent between ASC and the RAN. The Navy is the customer for submarine sea days.

But, in practice, nobody seemed to be able to get a handle on the problem. By 2008, the continuing downward trend was obvious. The slow progress of shipyard maintenance work then underway, which portended even lower future availability, led the government to place Collins-class upkeep on the 'Projects of Concern' list in November that year. The listing was intended to bring additional departmental and ministerial focus to the problem, with the aim of identifying and fixing the underlying issues and getting the fleet back onto a sustainable basis. The result was a renewed effort within the departments of Defence and Finance to get the various stakeholders together to resolve the problems.

The view from the DMO

One of the chief stumbling blocks was that there was no shared understanding of the drivers of fleet underperformance. The most visible problem was the sluggish throughput of work through ASC's yard—it's very hard to avoid noticing one or more 3,000-tonne submarines sitting on a hardstand for months on end, as was frequently the case. Then CEO of the DMO, Dr Stephen Gumley, recalls being deeply frustrated at what he saw as underperformance by ASC:

The problem was primarily with ASC at the time. They had the knowledge—or should have had the knowledge—of what needs to be done to the submarine. They had their records, they had the man hours being spent, and they were also the ones that would give the estimates for what full-cycle docking work had to be done ... Now what was regularly happening was that the time lines were slipping

out. ASC would say that with our 100 people or so we've got, we can do within N months and then it would end up being in N + 50% months.

As the head of the organisation with primary responsibility for the management of the Collins-class sustainment contract, Gumley took steps to bring the parties together to resolve the issues. In January 2010, Kim Gillis, then Gumley's head of submarine programs, reached out to then Managing Director at ASC Steven Ludlam—who had only just taken up the position—to coordinate a meeting between the two and then Chief of Navy Russ Crane. The meeting took place on the sidelines of the Pacific 2010 conference. Ludlam had a view that he:

... wanted to be customer orientated. Sounds a bit hackneyed, but I really wanted to understand what the Navy wanted. And I wasn't that bothered by what [the DMO] wanted. That was a contracting mechanism and procurement mechanism. And Kim said, 'Oh, the three of us have to work together. There's no doubt about that. And we have to create an enterprise.'

Ludlam's recollection demonstrates a focus on achieving the outcome of better availability, but also shows the overlapping arrangements and misunderstanding of roles between the Navy as the customer, the DMO as the agent and contract manager and ASC as the contractor. Like it or not, ASC was bound to the DMO's instructions, however imperfectly they captured the Navy's requirements.

Following that impromptu get-together, Gumley had the DMO coordinate a series of high-level meetings of the key stakeholders. While he had ASC's performance squarely in his sights as a major problem to be resolved, the difficulty in achieving a consensus remediation plan highlighted other enduring problems. The diverse cultures of the stakeholder organisations presented a challenge, as did securing adequate funding. And—probably most importantly, as we'll see later—it wasn't clear who was responsible for setting the highest level requirements, which Gumley says resulted in considerable angst:

There were a few times when a lot of frustration was being shown. I recall that there were a lot of tense moments at operational level. People were walking the ground at the ASC factory and so on. I'm not sure whether it was a management mismatch or cultural mismatch. I think money was part of the problem and culture came second. And then third were questions in the cultural side of things about who was in charge. Was it Navy saying 'They are our submarines', or was it DMO saying 'We're the client. Do as we say'? Was it ASC saying 'We know most about submarines. You'll do what we say'?

At the time, the Navy didn't have a clear idea of what it wanted or even what it might reasonably expect to achieve from the fleet of six boats. In today's approach to capability management within Defence, the Chief of Navy is the capability manager

for submarines and is responsible for setting priorities, stipulating capability outcomes and allocating resources to enable those goals to be met. The Naval Shipbuilding and Sustainment Group, alongside the Capability Acquisition and Sustainment Group (CASG, today's incarnation of the DMO), is the capability manager's agent to procure the necessary goods and services to meet the targets. That top-down approach seems an obvious enough arrangement, but in 2010–11 the situation was much less clear. Then, there was considerable 'bottom-up' driving of outcomes, with low levels of mechanical reliability and availability dragging everything else down. As Gumley recalls:

The client, which in those days was DMO, should have been in the driving seat, but they have, in turn, Navy as their client. And so Navy should be setting the top-level requirement: X operational sea days by Y submarines. And that should have been able to be said in one to three pages—no more than that—because it's a statement of what's required. And then the contractual relationship was between ASC and DMO. DMO was the client who had to manage a contract with ASC, and ASC had to deliver. It really wasn't up to ASC to tell Navy how many sea days they can have.

Those remarks are very close to what ultimately proved to be the right model. But, as time went by, and availability issues worsened rather than improved despite the best efforts of the various parties, relationships began to fray.

ASC under pressure

For its part, ASC was feeling itself to be under pressure and unfairly blamed for all of the fleet's ills, although also recognising that its own performance could be improved. The company felt that the problems extended well beyond its part of the overall endeavour and was frustrated by what it saw as a lack of consistent and clear guidance from the DMO and the Navy. Being owned by the Department of Finance at a time when government policy was to offer ASC for sale to the private sector didn't help, and continuing underperformance when measured by submarine availability wasn't welcome news to the government as owner and would-be vendor.

Stuart Whiley is today the CEO and Managing Director of ASC and has been deeply involved in ASC's submarine sustainment efforts since the first deliveries of new-build boats in the 1990s. From 2009 to 2014, he was ASC's General Manager Collins Class Submarines. That provided him with no shortage of challenges to work on:

It was obviously very difficult; there were a number of reliability issues inside Collins. There were issues related to the supply chain, funding, crewing and availability of submarines. And we had a number of cases where we essentially had zero availability of submarines, which was an event that triggered a

Prime Ministerial discussion. And that flowed back down to us and put pressure on where we were from a Collins perspective. We weren't in a good spot at all.

Sean Costello is a former submariner who had also been a ministerial staffer and defence consultant. He was hired by Steven Ludlam to lead ASC's client engagement in the Collins-class sustainment remediation efforts. He's blunt in his assessment of the impact of the pressure on ASC's workforce at the time:

ASC felt like a punching bag for other people's emotions and a scapegoat for other mistakes. There was a sense of injustice and frustration because the company is staffed by loyal and patriotic people. Morale was low. The sale process interfered with getting business fundamentals right. There was no way of talking about the problems, only accusations.

The Navy struggles with multiple problems

The Navy wasn't in much better shape. Instead of being in a position to drive outcomes by providing clear guidance on the required number of MRDs and setting a timetable for submarine operations and training voyages, the leadership of the RAN had many other problems vying for its attention at the time.² Many of those other issues were also attracting unwelcome headlines. In the months before the Coles review was announced, the Navy's fleet of amphibious ships became the issue of the day when the service was unable to provide a vessel in support of relief efforts for coastal communities affected by Cyclone Yasi in February 2011. At the same time, the Armidale-class patrol boat fleet was suffering from seaworthiness issues at a time of a high rate of effort in the border-patrol task.

Ray Griggs became Chief of Navy in June 2011, not long before the review that's the subject of this volume was launched. He stresses that the Collins availability issue was just one of many problems highlighted in his incoming brief:

I had no amphibious ships available. I had very poor availability in the submarine force. I had very poor availability in the patrol boat force. So I would say the early part of my time as Chief of Navy was completely absorbed by dealing with those three issues.

And low availability wasn't the only problem affecting the Collins class. The Navy had had a shortfall in the number of qualified and experienced submariners for years, in part because of delays in the initial deliveries of the Collins boats as the previous Oberon class aged off. The result was a downward spiral; a shortage in experienced crews led to more downtime due to minor maintenance problems, which in turn resulted in fewer training opportunities to increase the size and deepen the experience profile of the workforce. Griggs not only had to get the Navy's input

into Collins-class sustainment right; he had to rebuild his own submarine workforce as part of rebuilding the operational capability:

When I took over, we only had three crews. And the experience level in those crews was low. I knew the exact cumulative experience level of each group. We used to monitor and we would move people around to balance out experience levels across the three crews. That's how dire it was.

A review into the management of the submarine workforce conducted by Rear Admiral Rowan Moffitt found significant problems in the way crews were managed and trained. But that report was only one of several on the Chief's desk. The Navy was also suffering from a lack of experienced engineers and technical project managers in its ranks, as a review into its amphibious capability shortfalls had identified in July 2011. And those it did have were spread thinly across several concurrent crises. Some experienced and dedicated naval officers played important parts in the story to follow, but the Navy had too few of them.

The DMO tries to right the boat

With Collins-class sustainment reaching crisis point, the DMO made a new appointment in 2011. It was unusual, perhaps unprecedented, to find an Air Force officer heading up a major Navy project, but Air Vice Marshal Chris Deeble had good 'project of concern' management credentials. He had previously managed to turn around the troubled development program of the multibillion-dollar Wedgetail airborne early warning and control aircraft. That involved—among many other things—fixing what had become a rancorous relationship between the contractor (Boeing) and the DMO. His reward for doing a good job on that very difficult project was to be given another one, and Deeble became the DMO lead in efforts to address the Collins-class sustainment problem.

Consistent with Stephen Gumley's perspective quoted above, Deeble's first step was to take a close look at ASC's performance. He came to the conclusion that there were structural issues within the contract between ASC and the DMO, which was basically a 'cost plus' contract; that is, ASC was paid for its inputs with little regard for the output of submarine MRDs. Deeble observed:

... the in-service support contract that we had with ASC did not incentivise behaviour. ASC were acting with no risk. They weren't incentivised to improve performance—it was very much turn the handle, this is what you get for the money you pay us and we have to make this amount of return, noting that they're a government business enterprise.

It became clear to him early on that this wasn't simply a matter of contractor underperformance. And, for its part, ASC was far from wedded to the cost-plus

arrangement. Steven Ludlam had already raised the idea of an incentive-based contract in discussions with the DMO in 2010. Ludlam was motivated by his successful experience in the UK, where he had negotiated an incentive-based contract between Rolls-Royce and the UK Ministry of Defence (MoD) around 2007 with a view to generating performance-based profits for Rolls-Royce and increasing submarine availability for the Royal Navy. ASC was also making other suggestions to help free up the increasingly unworkable system, including suggesting a benchmarking review in 2011 and holding internal discussions on ways to streamline deep-maintenance time lines. Both of those ideas were to also emerge as part of Coles review.

But it was hard for anyone to make headway with proposed initiatives in the prevailing environment. Deeble sensed strong echoes of his Wedgetail experience in the stakeholder relationships that he quickly became immersed in. He reflects that:

... when I first hit the program in 2010, it was fractured relationships, extremely poor, not just with ASC, but with the supply chain supporting it, and also with all of the key players within Defence ... one of the most fractured relationships was the relationship between Defence and Finance. And Finance, being the shareholder, clearly just thought Defence didn't know what they were doing and ASC wasn't the problem.

The Department of Finance was well aware of Defence's dissatisfaction with ASC's performance, although the channels of communication between the two departments weren't as healthy as they needed to be. Stacie Hall was the head of the shareholder team in Finance, with the responsibility to support the Finance Minister as the sole shareholder for ASC at the time. She recalls:

There was generally a fair bit of conflict and dysfunction across all relationships, and Defence's relationship with Finance, on budget issues as well as in relation to ASC, was tense from time to time. And that was mainly because of Defence's view that, since ASC wasn't performing, Finance needed to do something about it.

As reflected in ASC's view, the then government policy of privatising ASC added a level of uncertainty to the whole process and made it difficult for anyone to put in place long-term arrangements for the funding of ASC's sustainment work. Hall acknowledges that the policy 'was something that did create uncertainty in relation to the organisation's future, and it probably contributed to a bit of distrust and angst amongst the key stakeholders as well. Defence would obviously want to renegotiate all the contractual arrangements ahead of any sale.' She also had reservations about the cost-plus contractual arrangements on the grounds that they 'disincentivised performance because the longer it took to undertake sustainment activities the higher the profit actually was'.

Ironically, the support contract had been negotiated from the ASC side by Gumley prior to his move to the government side of the arrangement. But the prevailing sense of there being a lack of value for money now made it difficult to justify appropriating any extra funding. As will be seen later, ultimately the successful remediation process was achieved with very little additional long-term funding, although an injection of funds was required for the transformation process. But prior to Coles' work that wasn't politically possible—and might not have been productive in any case—in the absence of a clear way ahead and an agreed set of performance indicators.

Even as early as 2008, it was clear to informed observers that there was an issue. An ASPI analysis of ADF support and operating costs noted that the Collins-class sustainment budget per hull was less than the corresponding figure for the similarly sized Anzac-class frigates. That was surprising, as submarines are generally more expensive to operate than comparably sized surface combatants. Consistent with the ASPI observation, Steven Ludlam at ASC felt that the budget was 'was way short of any rule of thumb, or any norm in terms of what you should be given'. He recalls telling the DMO that the funding line was inadequate for the work required. His approach was to present the DMO with a breakdown of the work ASC judged to be necessary, and what it thought was possible with the money provided. The DMO wasn't persuaded, being of the view that ASC was inefficient in its use of resources. The result was an impasse, and by 2010 submarine sustainment was being managed on an *ad hoc* basis of one-year budgets, supplemented by occasional top-ups when money ran short—for which ASC had to approach the DMO to make the case.

The situation was frustrating for all concerned and was incompatible with managing a strategic capability. When the lead time for some parts was around the same as the budget cycle, any delay in obtaining funding could lead directly to maintenance schedule overruns. Stephen Gumley recalls things becoming especially problematic in 2010:

Around about 2010, [ASC] ran out of parts. We went off and got an extra \$50 million from, I guess, Finance to buy parts for the submarines. Then with the normal delivery time, they took six to nine months to turn up. So this is pretty clear evidence of elements of an unstable cyclical pattern for materials, which happens in industries where average delivery times are significantly longer than annual budget cycles that dictate the purchasing decisions.

Finance saw things much the same way. Stacie Hall thinks that the funding arrangements stymied attempts by ASC to put in place more effective arrangements with its suppliers. She describes the situation as having been 'very inefficient and short-sighted'. Needless to say, things were far from happy at ASC, and Stuart Whiley is of the view that the 'budgets at the time weren't really reflective of what, in my view, was needed for management of an asset like Collins. It was very, very tight.'

Despite Collins-class sustainment having been on the Projects of Concern list for two and a half years by 2011, efforts to remediate the problem weren't making much progress. Most of the parties involved continued to think that others were the main problem. Warren King was the DMO's General Manager under Stephen Gumley in early 2011 (he would become CEO later that year) and describes a situation in which efforts to bring the parties together were proving fruitless:

I think everybody was unhappy. We were at a disastrous state of availability, which was causing a lot of aggro. We could have a meeting over costs or performance or whatever, and basically agree to meet again, and all the parties would just be spending the intervening period getting even more evidence why they were right. We were going nowhere with performance, in particular, and costs.

It seems to me that we had to break this deadlock we were in where Navy wasn't getting what it wanted, but wasn't helping a lot, DMO wasn't getting what it wanted, but it wasn't helping a lot and neither was ASC. So the three parties were spending a lot of energy and a lot of money, but really not solving the problem and it seemed to me that we needed a circuit-breaker.

At the same time that the lack of progress in addressing the increasingly evident shortcomings was causing significant frustration within the submarine enterprise, the Department of Defence was running a different line to reporters and other researchers, insisting that any problems were minor and being managed. That was a strategy that would ultimately backfire. The world of submarines is notoriously publicity shy—it isn't called the 'silent service' for nothing—but some within the Navy and the industrial support base were sufficiently aggrieved by the distance between public statements and what they knew to be case to talk to *The Australian's* Cameron Stewart. Stewart recalls that what he got:

... institutionally from Defence was nothing but hostility. Their narrative at that time was 'The fleet is okay. We're meeting our standards.' People came to me, and they would tell me about crew shortages ... off the record, but with their hearts in a good place. Some were members of crews and some of them were contractors involved in refits. Frankly, they felt that Defence was not paying enough attention to the problems of the submarines [and that] the government was not doing enough to offset these problems. And I started writing the stories, which got a fairly hostile response from Defence. And that would actually bring more people out of the woodwork to talk to me, because they saw the disparity between the official line that everything was fine with the fleet and the reality that they were seeing every day that these boats couldn't go out the shed.

As well as embarrassing the government—never a good thing for a department to allow to happen—the unwanted publicity surrounding the submarine fleet was greatly complicating the planning for the replacement of the Collins class. Although

some within the Navy and other interested groups such as the Submarine Institute of Australia understood the long lead times required and had begun to discuss what was needed for the Future Submarine Program (as it was later titled) almost as the final Collins was being commissioned, it wasn't an easy sell to the government. In fact, as things stood, the widely known underperformance against Collins availability made it extremely difficult for the Defence Minister to generate a discussion with his cabinet colleagues.

Stephen Smith became the Minister for Defence in September 2010, inheriting a wide range of troubled Defence projects and some long-established cultural problems. Eighteen major projects were placed on the Projects of Concern list between 2008 and 2011, representing many billions of dollars of underperforming investment. (For comparison, by mid-2020 there were only two projects of concern.) He was being told that the number of Collins submarines in the water at most times was either zero or one, with what seemed to him to be remarkably lax readiness requirements, given the supposedly critical nature of a robust submarine capability in Australia's military strategy. At the same time, he was also receiving advice that the government needed to instigate project work on the Collins replacement program. The Collins successor was likely to be the most expensive defence project in the nation's history, at several times the \$10 billion cost of the Collins fleet to date. Not surprisingly, that wasn't a message that was received warmly in government circles. Smith recalls that his response:

... effectively was, there's no way in the world we can start a future submarine program process with the National Security Committee, or the Expenditure Review Committee, or my colleagues, unless and until we've actually made some progress on problems and have outcomes of Collins being in the water.

The by now largely dysfunctional nature of the submarine stakeholder relationships had come to the minister's notice. He sat down separately with most of the key stakeholders to discuss what he was increasingly seeing as an intractable problem. He received a very mixed set of messages:

Of course, every part of the system had a different view. Defence had a different view from Navy, had a different view from DMO, had a different view from ASC, had a different view from the submariners. So everyone had a different view.

Clearly, something had to be done. Yet another internal review or study was hardly likely to provide the answers that had eluded many prior efforts, especially given the rancorous relationships between the various parties. Ironically, one of the many other problems on Smith's and Griggs' desks pointed the way towards a possible resolution for the Collins problems. The failure of the RAN's amphibious capability and the negative publicity associated with the Navy's inability to respond to Cyclone Yasi had prompted Smith to commission a review into the Navy's fleet management

and the way in which ship sustainment and repair was being resourced and managed by Defence.

The review into the amphibious ships was led by Paul Rizzo, a businessman with a long history of management, finance and banking executive appointments, and he was supported by former senior military officers and a civilian engineer from Defence. The 'Rizzo report' was delivered in early July 2011 and described a set of systemic problems in the management of the surface fleet. They included a shortfall in engineering expertise within the Navy and Defence more broadly, a lack of a shared appreciation of seaworthiness as an organising principle for sustainment—as compared to the strong focus on airworthiness in the Royal Australian Air Force (RAAF)—and a diffusion of accountability and responsibility across the Navy and the DMO, which made it difficult for anyone to get a grip on the problems plaguing the sustainment of the fleet.

Those observations rang true to Smith—and also sounded familiar enough in the context of the submarines to get him thinking about conducting a similar exercise for the Collins-class sustainment problem. He wasn't the first to have that thought, as Gumley, King and Deeble within the DMO had already come to the conclusion that some of the cultural disconnects would benefit from a new set of eyes in the form of a neutral external party.

Commodore Paul Greenfield, who went on to be a member of the review team, recalls Deeble reaching out to him in the months before the review was launched. Deeble hoped to draw on Greenfield's experience in previous reviews of defence acquisition and sustainment practices, including prior work on the Collins, to help with an internal review.

Those tentative efforts made little progress in a difficult environment, although attempts at stakeholder relationship mending were moderately successful—at least to the point where the warring parties were able to be marshalled into agreeing to a major review. The planets finally came into alignment in the middle of 2011, when the minister and many of the internal players had all come to the conclusion that a circuit-breaker was needed.

As Stephen Smith recalls, there was general consensus on the need for an external review. It wasn't a hard sell to his cabinet colleagues Penny Wong (Finance) and Jason Clare (the Defence Materiel Minister at the time). Smith recalled that he:

... had a conversation with Penny to outline what we had in mind, and had similar conversations with Jason Clare. So you had a very close cooperation and deep commitment from the key senior officers, Warren [King] and Ray [Griggs, then Chief of Navy] as most immediately responsible. And you also had a very deep ministerial commitment from myself as Defence Minister, Jason as Defence

Materiel Minister and Penny as Finance Minister, the ASC shareholder. From Penny's perspective, we were spending hundreds of millions of dollars on the Collins on an annual basis and just getting no strategic return or submarine outcome. We all knew we had a future submarine program to plan down the track and we just had to get this fixed.

The question then became one of identifying the right principal(s) to run a review. It was clear that it was going to be hard to find an Australian who had the right combination of knowledge of submarine sustainment and the goodwill of the entire stakeholder group. And many of the possible local candidates had already had a crack at the problem, in any case. The DMO began casting around for possible candidates, reasoning that the most likely source of the services required was the Five-Eyes community, because the defence cultures of those countries were most closely aligned and sensitivity issues were less problematic.

That didn't necessarily make the job easy. The US last operated a diesel-electric submarine in 1990 and had philosophically moved to an all-nuclear fleet long before that. A few Americans were quietly sounded out, but the US Navy's 'all nuke' ethos and its resolute determination to not be seen to have conventional submarine expertise any more (in case a future budget-cutting exercise in Washington resulted in the nuclear fleet being eyed up as a potential saving) effectively nixed the idea. New Zealand has never operated a submarine, and Canada was arguably doing even worse with its Victoria-class boats than Australia was with the Collins.

Like the US, the UK had made a decision to transition to an all-nuclear fleet, and the Royal Navy paid off the last of its Upholder-class conventional boats in 1994. But the politics of conventional submarines was much less fraught than in the US, and the UK provided training and initial support assistance to Canada after selling the Upholders to the Canadians.

The genesis of the review

The announcement

The timing of the announcement by Minister Smith of what was to become known as the Coles review (although it was later formally named the 'Study into the business of sustaining Australia's strategic Collins class submarine capability') a few weeks after Cameron Stewart's article appeared in *The Australian* was suggestive. After all, announcing a review of something that's become politically embarrassing is a tried and tested way of defusing the situation. But the announcement hadn't come out of nowhere. Smith had already been looking for solutions, and the DMO had been on the lookout for someone who could do the job, although the bad press provided a strong incentive to make an early announcement.

John Coles recalls that Warren King reached out to him in mid-2011 to see whether he would take the lead role in a review of Collins support arrangements. A naval constructor who had served in the Royal Navy's Constructor Corps, Coles had developed a solid reputation as a senior civil servant who had sorted out some significant issues associated with Britain's nuclear-deterrent submarines and as a naval support consultant, having also completed studies for the UK and New Zealand defence ministries. As explained to him in that initial discussion, the proposed scope of the work was much more constrained than the sweeping study that was eventually completed, being mostly concerned with the performance of ASC:

[King] asked me to help with a bit of benchmarking at the ASC. Maybe he believed the whole problem was down to the ASC ... and they were the cause of all this because they were so inefficient. That's why we didn't have any submarines available. He asked me to write a paper, which I did with Arthur [Fisher], about what we could do, because we had benchmarked submarine maintenance in the UK.

In a speech to an ASPI audience on 19 July 2011, Smith announced that John Coles, a British naval engineer and industry consultant who had previously reviewed the availability of the Royal Navy's submarines, would head up a team that would report on the 'optimal commercial framework for the conduct of Collins-class submarine sustainment'. In his speech, Smith noted that:

... problems with the availability of the Collins class are of long standing, deeply entrenched and well known to the public. These problems are significant and highly technically complex. At times, we have seen as few as one Collins-class submarine available for operations. This situation is unacceptable but will not be addressed simply by continuation of the *status quo*.

He also took the opportunity to provide a strong incentive for the stakeholders in Australian submarines to sort out the problems, effectively holding the future submarine acquisition project to ransom until the Collins problems were sorted out:

Without having confidence in our capacity to sustain our current fleet of submarines, it is very difficult to fully commence, other than through initial planning, the acquisition program for our Future Submarine.

That public announcement came as a surprise to John Coles, who was thinking that the discussions he'd been having with King were a negotiation about the scope of work to be performed, with more details to be sorted out before a firm commitment was made:

I think it got overtaken by events. The thing has been announced, and I hadn't even been asked to do it. Warren rang up again and said, 'You might hear your name mentioned in the press as going to lead this study.' And that's how it started.

The minister used Rizzo's five-month time line (the amphibious review was commissioned in February 2011 and delivered in early July) as a template for the new review. The initial thinking was that Coles would deliver an interim report in December 2011 and a final report in March 2012. That would prove to be wishful thinking. For a start, the scope of the study still required considerable refinement. Coles didn't want to be constrained to focus on ASC as, based on his experience elsewhere, he knew that the right focus for the study wasn't a narrow benchmarking of ASC's performance. Instead, he knew that the right approach was a wider view of all the elements that had to come together to produce the required end result of improved submarine availability.

Terms of reference

That clearly wasn't going to be a quick exercise, and Coles thought that the first step should be a scoping study to get a snapshot of the overall enterprise. As he puts it, 'I couldn't come out and just do benchmarking straight away—I'd have to find out what this was all about.' The terms of reference for the study were drafted within the DMO and anticipated a four-phase process that sketched a fairly accurate picture of what was to follow over the next few years, although at this stage those phases were expected to be on a much more compressed time line than turned out to be the case. (See Appendix 1 for the study phasing and time line and Appendix 2 for the full text of the terms of reference.) They also reflected a wider view of the problem than just the performance of ASC, allowing for the possibility that the DMO and the RAN would both have to implement reforms to their management of the ASC contract.

Although he was firmly of the view that the problem lay with ASC, Stephen Gumley was prepared to have the Defence side of the arrangement explored as well, recognising that poor contract-management practices can sometimes be the cause of contractors' underperformance:

The problem was primarily with ASC at the time, but . . . you always have to explore both sides of the equation, client and contractor. So, if the contractor is under pressure, you've got to check whether the client is self-injuring or whatever.

That's ironic, given that Gumley had negotiated the contract from the ASC side. In a sense, he had done too good a job and was now living the consequences from the other side.

Given the politics that surrounded the enterprise at the time, the terms of reference did a fine job of being general enough to allow Coles to pursue whichever avenues that he saw as appropriate while focusing on the right objectives for the major stakeholders. The deliverables of the review were both clear and appropriate, being focused on tangible outcomes for ASC (and thus its owner, Finance) and for the Navy (paragraphs 3.7 and 3.8):

ASC wishes to identify world best practice goals in order to establish objective benchmarks against which it can demonstrate its improvements and compliance.

Defence wishes to ensure that the required availability of reliable submarines is delivered to the RAN through the Collins Class Submarine Integrated Master Schedule at an affordable price and represents value for money.

There were a couple of notable omissions from the terms of reference. They avoided the issue of ASC's ownership and governance framework, which was still a live issue at the time. That was probably because the issue was less pressing under the then Labor government than it had been under the Howard government, but also because privatisation couldn't have been an attractive prospect when one of the firm's most important revenue lines was under a significant cloud. Instead, the review was restricted to an investigation into the commercial and contractual arrangements for submarine sustainment between ASC and the DMO. Nor was there any suggestion of making an evaluation of the fitness for purpose of the Collins-class boats—which suggests that the DMO was confident that the fundamental problem didn't lie with the boats themselves.

The review team

The scope of work being largely agreed and with sensible terms of reference in place, Coles selected a small group of professionals to work closely with him. As the study proceeded, he drew on external expertise from a wide range of sources, but the core team never exceeded four members. Two of his choices were people who had worked with him in various projects for the UK MoD: retired Rear Admiral Fred Scourse, a weapons electrical engineer, and Arthur Fisher, who had also served in the Constructor Corps. Both had 30–40 years of experience in the support of naval vessels and in change management, including with Coles when he was the CEO of the UK MoD's Warship Support Agency—an organisation whose role paralleled the DMO's responsibilities for fleet support.

The final member of the inner circle was an Australian, in the form of retired RAN Commodore Paul Greenfield. Both Coles and the DMO wanted an Australian on the team, which made good sense. Local knowledge and a familiarity with the Collins class itself would be immensely valuable in helping the predominantly British team come up to speed quickly. But there was a bit of wariness on both sides. Greenfield was nominated by the DMO, having already built up a good reputation for previous work on the Collins as a member of the 1999 McIntosh and Prescott review into the shortcomings and prospects for remediation of problems with the Collins class during the build and delivery phases. In particular, he had established a good working relationship with Chris Deeble. Greenfield thinks that DMO put his name forward to join the Coles team because it 'wanted an Australian on the team they

could trust'. For his part, Coles worried that he might have been being offered an 'agent' planted into the team to defend the DMO's position:

I said he might be in there as a bloody ringer, and we don't want that do we? We want to be independent. [The other members] said 'Well, we can try him, and if he's a ringer, we'll soon find out and tell him he can't be in, but we don't want to look a gift horse in the mouth.'

Those reservations didn't last long, and Coles realised that Greenfield was more concerned with getting the right outcome for the submarine force than with organisational politics. Coles now had a formidable team to work with:

Each of us had at least 30 to 40 years of experience in the submarine domain, one way or another. I'd lived and breathed it almost for 40 years. Arthur had worked in sonar systems and business processes for me in the agency. Fred Scourse was an experienced submariner who had been the head of nuclear safety and led many major procurement programs, and of course there was Paul himself. If you stood that knowledge up against anybody we met, without exception, it would dwarf it. We had 140 years of experience between us in submarine procurement, and in submarine maintenance in particular. We were unconsciously competent.

With the team in place and with terms of reference broad enough to allow a wide-ranging examination of the submarine sustainment enterprise, it was time to get to work.

The Coles review team

John Coles CB FREng RCNC

John Coles had extensive experience in managing the support of naval vessels prior to being appointed to review the Collins-class sustainment. His training was in naval architecture and engineering and he spent almost 20 years after graduation working on design, construction and acquisition projects. The second phase of his career—of which he says he 'got into by accident, and didn't want to do it'—was in naval support. He became the Chief Executive of the UK's Ships Support Agency (responsible for the maintenance and repair of all Royal Navy ships and auxiliaries) in September 1997 and became head of the Royal Corps of Naval Constructors in April 1998. In April 2001, he became the Chief Executive of the newly formed

Warship Support Agency. From January 2005 until March 2007, he was head of the Future Aircraft Carrier (CVF) project before leaving to run his own consultancy business supporting both industry and the UK MoD.

Arthur Fisher C Eng MIEE (dec.)

Arthur Fisher was a civilian professional engineer with the UK MoD for over three decades. He came to know John Coles while undertaking assignments associated with the development, acquisition and support of sonar and combat systems and as an Integrated Product Team leader for the support and acquisition of the Type 23 frigates. He also managed significant change programs, including the privatisation of the former Royal Dockyards, the supply chain (storage and distribution), warship support and modernisation (the integration of contractor and naval personnel engaged in sustainment for both submarines and surface ships) and the establishment of the Submarine Support Management Group.

Commodore Paul Greenfield AM RAN (Retd) BE MIEAust

After a 33-year navy career as a weapons electrical engineer officer and submarine officer, Paul Greenfield then spent more than a decade as an independent consultant to defence industry, where he focused on testing and evaluation, safety, complex procurements, the Collins submarine project, and the development of major capital expenditure programs. He was Head of Secretariat for the McIntosh/Prescott review of the Collins-class submarines (completed in 1999) and Project Director for the Collins remediation program that followed the delivery of the boats with a number of capability shortcomings.

Rear Admiral Fred Scourse RN (Retd) CB MBE FREng

A former Royal Navy submarine officer, Fred Scourse was appointed Assistant Director for the Trident submarine program and then Head of Reactor Safety before becoming Military Assistant to the Chief of Defence Procurement in 1987. He went on to be Director-General of Surface Weapons in 1988. In 1996, he was appointed Acting Controller of the Navy and Director-General of Surface Ships. After his retirement from the Royal Navy in 1997, he became Nuclear Weapons Safety Adviser to the UK MoD and a consultant to the UK Office of Government Commerce.

Chapter 2: An overview of the enterprise (Study phase 1)

It was clear to many of the players involved that there wasn't going to be a 'magic wand' solution. In an early conversation with Stephen Smith, Coles warned the minister that his experience with UK programs suggested that there would be more than one cause for the seemingly intractable problem, rather than a single point of failure amenable to an easy fix. To some, one of two straightforward explanations sufficed. One possibility was that the problem lay mostly in the ASC yards. To others, especially to those outside the day-to-day business of sustaining and operating submarines, it seemed likely that the Collins boats themselves were the root cause of the problem. If that were to prove the case, no changes to the contractual and organisational arrangements would make a substantive difference. That was where the review would begin.

Evaluating the Collins class

Of the issues unaddressed in the terms of reference, John Coles was happy to not have to confront the issue of ASC ownership, regarding that as the Australian Government's business to manage. But he took a different view on the 'zeroth order' question of the intrinsic capability and mechanical reliability of the Collins class. He had heard various rumours and stories that had circulated around the naval engineering world. Paul Greenfield recalls that Coles first needed to convince himself that the Collins boats were worthy of further investment:

In John's mind, there was no point to go any further if it was a bad product or a bad asset that was never going to work. So that was something that he took on himself and why he was very interested in looking at the submarines, speaking to the crews and getting a view in his own mind as to whether they were viable or not. Because he said he felt that, if they weren't, then he really needed to tell the government that they got a bad product that was never going to work right.

It didn't take long to answer that question. After some initial briefings and discussions with operations and support people, it became abundantly clear that the failings were much more to do with organisational and management issues than with the systems in the submarine. Coles realised early on that:

... these were very capable submarines if they were managed properly. I talked to a lot of people in what I call the operational side and in [the Defence Science and Technology Organisation]. Although I was not cleared for obvious reasons [for 'Australian eyes only' material], I knew enough about what they actually

did and where they actually went. And knew if you went there and you didn't run it properly, you'd be in bloody trouble. And they worked and they have good equipment.

In his mind, that made it an imperative to sort out the management situation, especially given that the Collins support arrangements represented a significant impost on the defence budget, consuming almost 2% of the A\$28 billion 2010–11 appropriation:

I thought it was a worthless defence asset because it was never available ... spending half a billion dollars a year and getting nothing. You might as well throw them away. I almost said if you didn't do something, they were worthless.

While a positive assessment of the boats themselves was good news in terms of the future prospects for fleet capability, the underlying soundness of the equipment was a necessary but far from sufficient condition for ultimate success. In its 2006 *Capability development manual*, the Department of Defence set out a framework of 'fundamental inputs to capability'. The fundamental inputs are the collective elements that must be in place and working harmoniously together to provide effective operational capability: organisation, personnel, collective training, major systems, supplies, facilities, support, command and management. The Collins-class boats constituted the 'major systems' element, and some or all of the others—and the linkages between them—were now under scrutiny as contributors to the failure of Collins sustainment.

The fundamental inputs were managed by people spread across a wide range of organisations, including civilian, military, public-service and private-enterprise groups. It now seemed a fair bet that people and cultural issues, and complicated internal politics, were going to be at the heart of the issue. The review team had to tread carefully and resist becoming captured by one of several competing narratives before data was collected and the situation became clear. And, to succeed, the team needed to be able to deliver judgements that were definitive enough and with a sufficiently robust evidential basis to break down the resistance that could be expected after years of fruitless internal wrangling.

Understanding incentives

Those challenges were reflected in the approach that John Coles brought to the study. Finance's Stacie Hall recalls Coles saying very early on that 'Nobody wins unless we all win.' While no doubt based on early impressions of dysfunctional working relationships, it was also recognition that competing incentives existed. Perhaps most obvious was the classic 'principal-agent problem' between the DMO and ASC, in which the incentives for the two parties were misaligned. The DMO's incentive was to deliver the availability of an important defence asset to the RAN,

but the contractual arrangements were such that ASC was earning revenue proportional to the time it spent on maintenance, independently of whether Defence was getting submarine availability in return.

Business schools teach that the way to resolve a principal-agent problem is to realign the incentives of the parties and improve the flow of information, and there was certainly plenty of scope for improvement in both of those areas. It was clear that a performance-based contractual arrangement would ultimately be required, although at the beginning of the review there was insufficient data to allow the specification of performance levels that both sides could agree upon. And information flows were poor, not just because of the strained working relationships, but also because of some structural issues in the assignment of responsibilities that would be identified as the study progressed.

But there were also strengths to work with, provided the warring tribes could be brought together. Despite the strong commercial angle in the relationship between ASC and the DMO and the often unclear linkage between the Navy's high-level requirements and the DMO's contract management, there was also an underlying unity of purpose. For Stacie Hall, the view from the neutral ground of the Finance Department, removed as it was from the day-to-day wrangling in the defence sector, allowed her to see the submarine enterprise as:

... a real collaborative effort. The submarine community's a really tight-knit, professional, committed, passionate sort of cohort. The ethos, and the belief of the submarine community of the importance of the capability, of the importance of the mission and how it contributed to the overall defence mission was something that really struck me as an outside observer. There was just so much commitment and dedication and genuine goodwill, despite all the contractual disputes, and the really ugly problems, and the situation that people found themselves in. And that was sort of infused through all of the engagements.

As the contract manager for the review, the DMO wanted findings and recommendations that were very hard to argue with and that had a good chance of breaking down long-entrenched positions, including in future contract negotiations. Warren King stressed to the review team right from the start that the review must be evidence based. In that, they had the right man in Coles, who brought a forensic and rigorous approach to data collection and analysis, consistent with his quantitative engineering background. Paul Greenfield realised fairly early on that this was going to be a rigorous exercise:

... it had to be evidence based. I was expecting something like in that earlier review³ where the group of us asked questions, and when we got the same answer from three different independent people, then we knew there was some

something behind that. But it wasn't actually evidence. And so John was looking for something more than that. He wanted to see facts and figures, black and white, on paper. He said he wasn't prepared to write anything he couldn't prove in a court.

Work begins

But the gathering of hard data had to wait for later phases. The first phase was very much a case of surveying the landscape and determining the extent and nature of the problem before later quantifying it. The team decided early on that they wouldn't read the reports from the previous 18 reviews. They wanted to gather their own impressions and were also aware of the potential for the review to be used to try to assign blame for past underperformance. They were firmly of the view that the correct approach was to eschew retrospection, survey the contemporary landscape and then chart a path for the future.

As with any review work, it was important to draw up some guidelines for what was to be included and what was not. After some early enquiries, the review team excluded a range of topics from its consideration, not because they weren't important, but because they weren't thought to be causing any problems. Those included ammunition and weapon availability, the facilities used to support the submarine program (naval bases, broadcast facilities, ranges and test facilities), rescue equipment and general consumables such as oils, fuels and food.

So the team hit the road and visited as many of the important players as they could identify. That was a significant undertaking in its own right, involving 60 interviews with more than 100 people in a three-week period and spanning the breadth of the continent. The interviews were on a non-attributable basis to give the best chance of capturing unvarnished views. They spoke to officials in Canberra, Adelaide, Melbourne and Fremantle and visited ASC facilities in South Australia and Western Australia, as well as critical suppliers such as Pacific Marine Batteries in Adelaide and Raytheon in Western Australia and Canberra. Getting a feel for the submarines was also judged to be a priority, and the team inspected vessels under maintenance at ASC Adelaide and an operational boat in the west.

They were prepared to encounter scepticism—the first words spoken by one interviewee were 'What good do you think you can do as the 19th review in the past few years?' Despite that, their initial observations were far from being all 'gloom and doom'. The team found that a commendable 'can-do' attitude prevailed at the operational edge of the enterprise, as noted in their first report:

[W]e were impressed by the facilities themselves, and by the dedication and commitment of the people we met, even where it was obvious that there is considerable pressure and overload as a result of the overall state of the

submarine program. Team spirit was particularly evident in WA, where all the immediate sustainment issues hit home ... The operational submarine we visited was well prepared for operations and impressed us with the pride and keenness of her crew.

Impressive as the morale and drive were at the front end, it was also clear to the review team that it was coming at a considerable cost to those involved. The team noted that even the keenest personnel were being hampered by systemic failures further up the supply and command chains, which caused enduring stresses at the operational end. That was taking a noticeable personal toll on the people involved. Greenfield recalls that:

... some of the guys in Western Australia—and I'm not really talking about the crews so much, but the support people—the officers were just driving themselves into the ground. With one look at them you knew something was wrong. These guys were totally overworked. And it was because of their can-do attitude.

There was clearly a health and safety issue there. Coles knew from his previous experience that tired and stressed people who were constantly having to find workarounds represented a significant risk in submarine programs, which require greater than usual attention to rigorous safety procedures. The growing risk profile was widely—if not loudly—acknowledged in the submarine community at the time. I was told by a submariner around that time that members of the submariner community were increasingly worried about the potential for a Collins boat to be lost through accident. Thus warned, Coles took it upon himself to see Ray Griggs as Chief of Navy 'on the quiet' to let him know that some of his people were being run into the ground, and the potential implications of that. That wasn't to be the only time during the review that informal channels of communication were used to help inform important players of critical observations.

As discussions progressed, it rapidly became clear that the dire situation then prevailing was the result of a team effort—everybody had played a part in creating the collective dysfunction. As Coles recalls it, 'We weren't looking for someone to blame and wouldn't have found anyone in any case.' The review team was much more concerned with making an early identification of the person(s) charged with 'taking full responsibility clearly and decisively for all aspects of the sustainment of the Collins-class program'. Again, they drew a blank: while many players had a degree of control of their own local operations, nobody had responsibility or authority at the program level.

Even worse, there was no collective understanding of even the highest level objectives. The Phase 1 report notes that:

Despite the fact that virtually all the senior people we spoke to were clear that the Collins Class capability is ‘strategic’ for Australia, there is no clear or shared public understanding of why this is a strategic capability nor of the implications that this has for sustainability. This leads to misunderstandings, ambiguity, and a lack of common purpose.

Seen in that context, the problems with the sustainment program are much less surprising: if there’s no shared idea of the high-level outcomes being sought, then the various elements involved will tend to pull in different directions by making resource allocations according to their own understanding and needs, even when everyone is acting collegially and with goodwill.

The team observed that nobody had the process ‘gripped up’ and that there was an overall lack of leadership. It had trouble identifying anyone with the assigned responsibility and authority to oversee the translation of the strategic aim of the submarine capability through to realised operational capability. One candidate for that role was Commodore Greg Sammut, who was then Director General Submarine Capability within Navy headquarters,⁴ but Sammut himself wasn’t entirely clear about where his responsibilities began and ended. Greenfield recalls that, when the review team asked Sammut whether he saw himself as the head of the submarine community, there was a long pause before he cautiously allowed ‘I suppose so.’ When asked about the difficulties that he was wrestling with, Sammut explained that there wasn’t even any consensus about what a reasonable set of expectations for the Collins would look like:

[It was] difficult for us to actually have a clear view on what should we expect of availability from a boat designed and built in the 1980s and 1990s. We know what it was for the Oberons, given that they were a proven product. And the big difference, of course, with Collins is that we were the parent navy of our product built to our requirements⁵ ... [H]aving realistic requirements has always been something important to me. It’s easy to set a requirement and bash enablers for not meeting your requirement. But, if you don’t understand what your requirement is, you’re complicit in the outcomes.

That was among the many things that the review would help with in the future. But at the start there was a profound shortfall in experience of submarine management that extended from the central planning and program management areas in Canberra out to the ‘hands-on’ parts of the enterprise at Osborne and Henderson. The review noted that:

In Canberra, it is difficult to find more than a couple of individuals with any serious claim to submarine domain knowledge; in SA and WA, the participants are critically dependant [*sic*] on a few key experienced individuals. The impression we gained was of an organisation surviving from day to day, with no spare capacity to think about the future.

Not that goodwill was in ample supply in the Collins-class sustainment community. While individual groups were often strongly motivated by their belief in the strategic importance of the capability and working very hard indeed—as evidenced by the readily observable strain on many of them—there was little in the way of constructive feedback between the various elements. And it was sometimes worse than that. Coles and his team were struck by the often adversarial nature of the working relationships and by the toll that was taking on some of the personnel involved. Their report didn't pull its punches in that respect, describing in one place their impressions of 'highly-charged, difficult and often hostile relationships between the parties' and saying elsewhere that 'relationships are mainly difficult and fractious'.

Identifying problems

The review team was trying to be careful to be seen as not seeking to apportion blame or to be taking sides. But, as it began to identify the root causes of the obvious relationship difficulties, it was unavoidable that it would have to be critical of one or more of the parties involved. It could hardly be otherwise, given the degree of dysfunction to be found. When it came time to draft the report, the review team was careful to provide context for remarks that were critical of any of the entities. For example, when discussing the role of the Department of Finance, the report acknowledged that 'managing a monopsony situation can never be easy' before going on to observed that Finance:

... does not, as owner and shareholder, set specific numeric performance goals on ASC to align with goals set by the customer (DMO and RAN); rather, it provides ASC with corporate objectives and a mandate founded on ASC efficiently and effectively discharging its submarine sustainment role and a principle [*sic*] objective to add to shareholder value. This point could be addressed once the results of the benchmarking study are available.

That last sentence pointed towards one of the major pieces of work to be conducted in the follow-on phase. Establishing a benchmark for submarine availability should have been done long before the Coles review began, and the lack of even broad guidance was a key indicator that the whole Collins program had been managed—and indeed planned—without sufficient rigour. Ideally, the strategic rationale for a submarine fleet should have included an indicative mission profile and concurrency requirement, from which would have followed the required number of operational days. The necessary fleet size should follow from that consideration, informed by estimates of the availability that could be achieved in the support process. Instead, it seems that the fleet size of six was arrived at in an *ad hoc* way.⁶ Even so, performance indicators for the support arrangements should have been developed no later than the delivery of the first boats to the Navy in the late 1990s, at the time when the first

maintenance contracts were signed. There could be no long-term solution without some numbers based on hard data. To be fair, that wasn't something the Department of Finance was capable of doing on its own, since setting defence strategic goals and planning submarine operations are far removed from its core business. Rather, as the owner of ASC, it should have been working with the Department of Defence to set the key performance indicators on the industrial side.

The review also identified significant problems in the way that Defence was managing its contractual relationship with ASC. The report paints a picture of a somewhat high-handed approach that attempted to manage the contractors directly, rather than setting performance goals and letting ASC decide how best to apportion resources:

DMO sees its role as a rather intrusive form of interaction with ASC, seeking to exercise control and thereby discouraging ASC from taking an appropriate level of responsibility for outcomes. We found many instances where accountability, authority and responsibility are misaligned, fragmented or simply not understood. For example, the Collins Class Program Manager has no recognised authority outside his own program or the DMO, even though it's impossible to deliver sustainable submarine performance without this.

Stephen Gumley had departed the DMO before the Coles review delivered its first report, but he had presided over the management of the Collins contract and the DMO's relationship for several years. He concedes that there were cultural differences that caused friction, although in his view budget issues and the politics surrounding the defence budget were more significant. However, that perception of the pre-eminence of money among the problems isn't reflected in the report, which mentions budgets only in a couple of places, instead placing more emphasis on haphazard organisational arrangements and the lack of obvious lines of accountability. But there might be something of a chicken-and-egg dilemma behind that analysis. In most circumstances, the willingness to provide funding to fix a problem depends on having confidence in the soundness of management processes and a reasonable expectation of good outcomes. As submarine availability started to fall off and relationships started breaking down, that raised the political cost—in both the internal politics of Defence and in the wider government—of putting more money into what was being increasingly seen as a failing enterprise. And nobody had much confidence that the problems would be resolved even if extra money were to be made available. It was clear that there was a complex interconnectedness of problems at various steps of the submarine sustainment process.

One of the easily identified issues was the time that submarines were spending out of service during maintenance periods. Here, ASC was squarely in the cross-hairs, and the review team identified serious inefficiencies in the full-cycle docking

(FCD) deep-maintenance work being conducted at ASC's main site at Osborne.⁷ In contradistinction to the impressive focus observed at the closer-to-operations end in Western Australia, the team found that in Adelaide '... the tempo is different. Full Cycle Dockings are three-year jobs, which is a long time even by modern nuclear submarine standards.' The comparison with nuclear submarines reflects Coles's experience in assessing fleet-maintenance work in the UK.

An obvious, if unedifying, explanation for that apparent lack of urgency was the structure of the contract with the DMO, which saw ASC being paid for work largely independently of outcomes. The report notes that there was a 'strong perception' of that being the main cause of inefficiency, especially within the DMO. But the review team wondered whether other factors were also at work. For example, the RAN had publicly admitted to a serious problem in manning its submarine fleet, which reduced its demand for submarine sea days. The mining boom of the mid-2000s had seen many submariners and Navy engineers leave the service, and keeping crewing levels up became difficult. The RAN conducted a major review of submarine manning in 2008 and, while submariner numbers had stabilised as a result of initiatives taken after that review, the Navy was rarely able to crew more than a couple of boats at a time. As a result, the team suspected that the RAN wasn't using its leverage as the end user of ASC's support activities to push for a faster throughput:

It was not evident to us that there was any incentive to complete FCDs more quickly; perhaps, if they were completed faster, there would be an embarrassing knock-on effect on crewing, which inhibits the customer from demanding more.

In fact, there were problematic arrangements nearly everywhere the team looked, and the Collins availability problem wasn't entirely a product of poor working relationships—although those certainly tended to exacerbate any other issue. For example, some of the problems faced by ASC were 'baked in' by the process that set up the support arrangements in the first place:

The problems originate from the very beginning of the program when, perhaps without fully appreciating the potential consequences, the Commonwealth embarked on the acquisition of a submarine which, for good reason, is quite unlike any other in the world.

Due to the inherently dangerous nature of submerged operations and the tight coupling between many of the design elements in a submarine, maintenance requires a deep understanding of both the overall design and of the way in which various subsystems interact. There needs to be a 'design authority' with the responsibility and ability to maintain a detailed, holistic view of the integrity of the vessels as they're maintained and modified over the years following delivery. The obvious candidate for that role was the Swedish firm Kockums, which had been the successful tenderer in the competition to design the Collins. However, there had

been a significant falling out between the Australian Government and Kockums, including a Federal Court case between the parties in the early 2000s concerning intellectual property rights.

So, when the delivery of the boats was nearing its end and operational support needed to be ramping up as they entered service, instead of a smooth transition, the restructuring of ASC as a government business enterprise with the Department of Finance as shareholder and the DMO as customer:

... created a structure which has proved challenging to operate efficiently in practice, and in which the exercise of ownership of elements of the design often presents practical or process difficulties. The original in-service support solution, including the usage upkeep cycle, was found wanting—exacerbated over time—as the links with the original Design Authority were, in effect, severed.

The result of not having Kockums as deeply involved in Collins support as it needed to be was that ASC found itself in the position of having to maintain highly bespoke submarines with an insufficient engineering understanding of the design.

Given all of those structural issues, it's perhaps not surprising that there were logistics problems as well. The previous submarine class in RAN service was the UK-designed and -built Oberon class. A supply chain that stretched around the world had presented many challenges to Australia, which were ameliorated only by the development of a robust indigenous capability to service and then upgrade the boats. In theory, the local build of the Collins class should have allowed for a much smoother arrangement to be put in place from the start, but the arrangements that the review team found were seriously wanting, reflecting a lack of clear lines of accountability and reporting, rather than a well-thought-out arrangement for supporting an important national capability.

The complex and overlapping supply chains for the Collins reflected a series of 'historical accidents' and a complicated relationship between the Navy as the end customer, ASC as the contractor and the DMO as the contract manager. In some cases, equipment required for support work had to pass through several sets of hands within the DMO and the Navy before arriving for use at ASC—sometimes even when ASC had procured it in the first place! That peculiarity came about because ASC was able to purchase materiel for its own use in FCDs in Adelaide, but all activities in Western Australia (including ASC's) were supplied through the DMO's Naval Inventory Procurement Office in Sydney, via the HMAS Stirling naval base. The team identified the resulting multiple handling as being clearly inefficient, concluding that 'a full analysis of the supply chain processes will yield significant benefit':

Other examples of areas where this kind of problem exists include the supply chain, which suffers from an excessively complicated structure, engineering where RAN rules seem to allow multiple decision paths to exist, combat system

engineering where responsibilities are fragmented, and overlap between the roles of numerous naval authorities.

Echoing the thoughts of previous in-house efforts as described above, the Coles review became a champion of the concept of an overall ‘enterprise management’ approach:

The strands of activity delivering the submarine capability should be operating as an ‘Enterprise’ consisting of four elements (DoFD, DMO, RAN and Industry) whose shared objective should be to deliver the right level of submarine availability at the right price.⁸

Delivering bad news

In reviewing the report before finalising it for the minister (and subsequent publication), Paul Greenfield was taken aback by how stark an assessment had been reached.

At the end of Phase 1, because we’d been living and breathing it for a couple of months, we’d become accustomed to how bad it was. But it actually was a shocking report—particularly so as it pointed the finger at strategic leadership.

Greenfield saw the shocking nature of the report realised after delivering the final draft to the minister’s office. Chief of Staff Paul Taloni and Deputy Chief of Staff Tom Hamilton were both former officials in the Department of Defence and were Smith’s point men on defence capability issues—Smith describes their relationship on the Collins issue as being a ‘triumvirate’ that was deeply committed to getting a good outcome. Hamilton read the report through and asked in alarm ‘My God, what have we started?’

That’s a reasonable enough response from someone who hadn’t been deeply engaged on a daily basis over several months. From the point of view of a government hoping to quickly fix a problem, it could scarcely have been worse. As Greenfield’s assessment suggests, the ‘dot point’ list of key findings from Phase 1 is a damning indictment of the entire enterprise leadership. The one redeeming feature is that it indicated that the problem didn’t lie with the boats themselves. Nine and a half of the 10 points have nothing at all to do the hardware, and all 10 point towards systemic management failure as the root cause of the problems:

- Poor availability caused by a crew shortfall, lack of spares and unreliable equipment
- Strategic leadership lacks cohesion
- Finance, DMO, Navy and Industry not acting collectively as an ‘Enterprise’

- Lack of clarity of accountability, authority and responsibility
- Submarine domain knowledge thinly spread
- Lack of robustness of Navy's contribution to manning and sustainment
- DMO tends to seek direct involvement at the tactical level
- Performance based ethos yet to be embedded in the ASC
- No long term strategic plan for efficient asset utilisation
- Unclear requirement and unrealistic goals.

The main body of the report was unsparing in its criticism of the current arrangements and took pains to note just how thinly expertise was spread. The report also sounded a warning of significant risks that existed in the absence of sustainable arrangements, not just for submarine availability but also for the physical safety of the submarines and their crews. The reviewers warned that, unless the situation was remediated, it was 'just a matter of time before the program grinds to a halt or the risk of a serious incident reaches unacceptable levels'. That judgement wasn't based on mechanical unreliability but reflected a downward spiral of training levels among submariners, as declining availability meant that the number of training days at sea was reduced. That was a dangerous combination:

With submarines having to live with defects of operational safety significance, decisions on what to live with and what to return to harbour to fix are being made by inexperienced people; a worrying feature with profound implications for safety.

The main results of the Phase 1 report were released to the public by Minister Smith on 13 December 2011. Consistent with Smith's observation that progress on the follow-on class was politically difficult as long as the Collins issues continued to be unresolved, he also chose to release an update on the Future Submarine Project (SEA 1000) on the same day, along with a RAND Corporation study on Australia's submarine design capabilities and capacities. And, as he had when launching the review, he explicitly linked the Collins and future submarines in his press release, saying that:

[P]roblems with the Collins Class are of long standing and well known. It is essential that Navy and Defence learn everything they possibly can from the experience with the Collins Class to inform development of the Future Submarine project.

Because the Phase 1 report was released in the run-up to Christmas, when complex news stories struggle to get traction, there was a subdued public reaction to the report. But, not surprisingly, given his history with the story, Cameron Stewart filed a piece for *The Australian* that summarised the key findings and highlighted the safety

concerns. Stewart wasn't surprised by the findings, having already heard significant parts of the story from his sources, but he was taken aback by the candour of the report and was pleasantly surprised by the fact that it was prepared to be openly critical of essentially the entire management structure:

Before that, there was really no accountability, and that was what gave the institutional cover for the situation to go on for so long. When I saw [the Phase 1 report], I thought to myself, 'My God, they're really finally addressing this.' So long as they weren't just saying it without doing anything about it.

Doing something about it was, of course, the crux of the matter. After all, many of the previous 18 reviews had also managed to identify problems, but, for various reasons, including a lack of institutional 'buy-in' by various parties that thought that the problems lay with organisations other than them, there had been no successful follow-on remediation efforts. Minister Smith was certainly aware of the possibility of a repeat of the 'study followed by nothing' cycle. He reflects that:

... the highways and byways in Defence are littered with reports which everyone reads and says 'This is a very good report, it's got a series of recommendations. It's crystallised our thinking on this. That's good, we'll do this and we'll never have that problem again.' And then there's no check on implementation; there's no check on success. So it all fades away.

Smith, along with Penny Wong in Finance, therefore had little hesitation in signing off on follow-on work to turn high-level observations into a detailed implementation plan, with the aim of eventually fixing the problem. Given the incentives in politics for quick fixes and 'announceables', that was a significant vote of confidence in the team and a commitment to finally remedying what had become a long-term problem.

The Phase 1 report identified the follow-on work needed to produce a 'comprehensive program necessary to establish evidence based recommendations for successful sustainment and associated management for the Collins Class'. The emphasis was to be on defining outputs and allocating key responsibilities for achieving them.

The work had been taxing on the small team, not least because of the rancorous environment they found themselves charting, but they had done a lot of what was possible with the resources at hand. A considerable expansion of the number of people involved was required for the second—and most critical—phase of the project.

Chapter 3: A deep dive (phases 2 and 3)

Getting to the contract stage for the next phases of the work wasn't an easy process. Coles was always adamant that the way ahead should be based as far as possible on hard data, and no stone was going to be left unturned in the pursuit of that data. As scoped, the phase had four main threads, under the broad headings of Integration and Program Management; Commercial; Engineering, Reliability and Navy; and Costing, each with a number of subheadings (see box), but the size of the task was beyond the small team that Coles had assembled, so specialists in areas such as costing, heavy industry asset management and workflow breakdowns were needed to help with the work. He sought to bring a large consultancy firm—discussions were held with Deloitte, Ernst and Young, KBR and PricewaterhouseCoopers—and to recruit firms and individuals with subject-matter expertise in key areas.

Coles realised that he was also going to need a project-management team to coordinate all of the activity and wanted that to be independent of the DMO. That proved to be a tough sell to Warren King, who felt that the essence of the problem could be distilled with considerably less effort and expense. Even looking back in 2021, he remained unconvinced of the value:

I felt some of that was unnecessary, to be honest. I think with most projects, you can get to the heart of the issues pretty quickly. But John and the team wanted to do a lot of analytical work. At the end of the day, I think it gave data supporting some conclusions, but I don't think it changed much about ... what the thoughts were.

King and Chris Deeble were probably reluctant to embark on what would undoubtedly be a time-consuming exercise that could prove to be a sizeable distraction from the reforms they had already tried to instigate. Nonetheless, King was eventually talked around, knowing that the government had commissioned the review looking for a way ahead and seeing that Coles thought that the work was necessary. Once convinced, he then made the case for a deeper look at the problem to a Defence Minister who might have hoped for a faster resolution when sanctioning the review, obtaining approval for the next phase to commence. King again:

I don't think the minister or I thought it would go that long when it was all set up. I have to give the minister credit. When I went to him saying that I think this should be done, he got right behind it.

Work on the second phase began later than planned in March 2012, which effectively reduced the time available because the end date wasn't pushed back despite the delay. Deloitte was selected as the major consultancy firm and also played host to the management team, and Greenfield initially set up the office in the firm's Melbourne premises. (Coles, Scourse and Fisher had returned to the UK by that stage because of the delay in getting to contract.) Greenfield felt that he needed some expert engineering advice, so Bob Platfoot, an expert in industrial asset management from the firm Covaris, was added to the team. The UK-based firm QinetiQ, with which Coles had worked on the UK submarine sustainment arrangements, was also called upon for expert advice. Finally, BMT Australia, a maritime-focused technical consultancy firm, became the team's contractual vehicle and connection with the DMO.

The major analytical work was conducted in two major blocks of time: Phase 2 from March to June 2012 and Phase 3 from September to November the same year. While there was substantial overlap, Phase 2 was largely a data-collection and enterprise-mapping exercise, while Phase 3 drew on that work to develop a set of recommended actions to redress the problems identified and to draft a road map for the transformation that the enterprise would need to make. They're closely related and, somewhat confusingly, the November 2012 publicly available Phase 3 report was essentially an unclassified version of the Phase 2 report delivered internally in June, without much of the voluminous detail available in house. However, it should be noted, as will be explained below, that the results of Phase 2 had already started to generate positive outcomes while Phase 3 was still underway.

The four threads of phases 2 and 3

1. Integration and Program Management

Leadership and Governance. To manage the work streams and integrate outputs. To manage the program governance arrangements and stakeholders to provide program coherence and acceptance.

Program Management. To assess the current program management capabilities and structure of the Australian Submarine Program Office and make recommendations as to remedial actions necessary to achieve an optimum position.

2. Commercial

Industry Analysis. To analyse, understand and map the relevant industrial supply base and to conduct a Supply Chain Vulnerability study.

Contracts Analysis. To map the contractual landscape, and analyse current commercial mechanisms and structures to determine the opportunity and appetite for refinement and optimisation of commercial arrangements.

3. Engineering, Reliability and Navy

Operating Model and Benchmarking. To determine an optimal operating model by undertaking benchmarking of operations at ASC to determine reasonable and realistic performance standards across the participants operating.

Reliability. To define optimal approaches to engineering processes, structures and required skills and competencies across the enterprise.

Navy Sustainability. To analyse the current challenges/constraints faced by the Navy in sustaining Submarine branch capability—making recommendations as to remedial actions to achieve an optimum position.

4. Costing

Cost and baseline. To undertake a high level base lining exercise to identify funding pots, the transactional flow, and the relationship between costs and operational drivers, to enable the design of an Enterprise Cost Model.

A new appointment

Even while Phase 2 was underway, there were signs of a more positive attitude to submarines within the government. Minister Smith was sufficiently impressed by the prospect of an improvement in submarine availability—and hence a reduction in the political cost of being seen to support submarines—that he could now take proposals for the future submarine to his cabinet colleagues. The government took the first formal steps in the Future Submarine Program in May 2012, announcing a range of detailed scoping studies on the future boats. And it was prepared to put money behind it, earmarking \$214 million for the detailed analyses that were required. Coming before any tangible improvements in the overall outcome, that was a significant vote of confidence in the work of the Coles review.

The May 2012 submarine announcements included an important new position within the DMO, naming David Gould, a defence company executive from the UK, as the first General Manager Submarines in the DMO. Gould had previously been Deputy Chief Executive and Chief Operating Officer of Defence Equipment and Support in the UK and had often worked closely with Coles and Fisher, and at times with Fred Scourse. Minister Smith explained that Gould would have carriage of the Future Submarine Program (given the project designation SEA 1000 within Defence) as well as the Collins remediation. Gould took the job with his eye on the future submarine as the most enticing challenge, but soon realised that the Collins would be consuming a fair proportion of his time. He recalls that:

... my real motivation was SEA 1000, because here's a chance to pick up a project from scratch, and see if I can implement all the things I've learned over the years, right from the start. But I soon realised that SEA 1000 will actually be on the back burner for a bit, because unless you can restore confidence between colleagues, and therefore, the whole Australian submarine enterprise, and demonstrate the operational value to Australia, SEA 1000 would never happen anyway. So I had to focus on Collins.

Phase 2 methodology

Under pressure to produce quick results, the now augmented team set to work to produce a deep understanding of the end-to-end submarine enterprise. The aim was to produce a detailed map of the enterprise 'value chain', with the aim of producing a granular understanding of who did what, and where the critical interdependencies lay.⁹ It was hoped that the resulting dataset would help to crystallise future organisational arrangements and accountabilities. As well as conducting extensive liaison with all of the key players (more than 200 people from 12 key companies and organisations), the team worked its way through thousands of documents provided by the RAN, Finance, the DMO and ASC.

Two other important activities were run concurrently with the development of the value-chain study. An extensive cultural survey would be conducted to add hard data to the Phase 1 findings on people issues. On the hardware side, there would be a benchmarking exercise of the sustainment performance of six other submarine-operating nations. The metrics developed through the benchmarking exercise would provide measures by which success or failure could later be assessed.

The survey was intended to test the Phase 1 findings indicating significant cultural and management issues. Not surprisingly, some of the parties involved were happy enough to accept the notion that other entities had those problems but were less willing to accept that their own organisations were part of the problem. Hard evidence was needed to turn what was essentially anecdotal evidence into something harder to dispute. Coles recalls being told by Warren King that ‘We need compelling evidence that what you said in Phase 1 is true’, so a survey was designed to measure the efficacy of working arrangements within the submarine enterprise and to capture the views of the personnel involved. The survey was circulated to leaders and staff members from the Navy, the DMO, Defence HQ, Finance and ASC.

In terms of impact and value in making a dramatic point, probably the most important aspect of the Phase 2 work was the international benchmarking exercise. As well as fitting the overall approach of using quantitative data whenever it was sensible to do so, Coles knew that the benchmarking exercise would almost certainly prove to be galvanising to the senior figures to whom he would report. He had no illusions regarding Australia’s relative performance:

There’s nothing like being embarrassed. If you say to an Australian ‘You know, you’re the worst performing submarine fleet we’ve ever come across by factor of two everywhere’, well, they’re going to do something about it. So that was another part of the review, which was to get reasonable evidence of what actually you could expect to get and what the other navies get. And yours was terrible.

Doubtless because of the sensitivities involved, the six comparator nations haven’t been publicly identified. Similarly, the detailed methodology and the data collected, which was collated in an internal DMO document, the *International benchmarking report*, isn’t in the public domain. The understandable secrecy makes it extremely difficult to offer an analytical commentary about the methodology, but some of the challenges faced by the team when examining the data may have included:

- the difference in operating cycles between nuclear and conventional submarines (the US and the UK had moved to all-nuclear fleets 30 and 20 years, respectively, before the review)

- the different operational profiles of friendly nations' submarine fleets (for example, European nations such as Germany and Sweden operate at much shorter distances from base than Australia's wide-ranging fleet)
- the different life cycles used by foreign navies (for example, Japanese submarines are retired after 20 years of service, while the planned life of the Collins was more than 25 years).

Phase 2 findings

The conclusions and recommendations developed by the review team under phases 2 and 3 were many and varied. The output was substantial, and Coles recalls the complete set of internal reporting amounting to 'very nearly a foot of A4 paper', but for simplicity in this overview volume we can characterise them into three broad categories. One is 'culture', both intra- and interorganisational. The second category, which in a sense is a manifestation of the first, might be termed a 'humanities' thread and includes topics such as management, responsibilities, reporting chains and planning. The third is a 'technical' category, involving such work as the international baselining, a detailed look at and comprehensive rejigging of the timetabling of maintenance activities, and cost-benefit analysis.

Culture

One of the reasons for the observed dysfunction was that there were simply too many people involved in the management of the enterprise compared to the core tasks. In terms of the headquarter functions of managing the contracts and overseeing the sustainment of a fleet of six submarines, Coles thought that the right number would be about 60 people, based on his experience in the UK. Instead, he found that more than 240 were involved, within the Navy and the DMO. In the absence of clear direction, it's a tendency of overstuffed bureaucracies to invent 'busywork', which often involves setting up reporting chains and micromanaging activity, rather than letting the other party get on with their most important work. That's exactly what happened—the Navy was overmanaging the DMO and the DMO was overmanaging ASC. As Coles put it:

... the DMO had to stop being a tactical organisation to be more strategic and actually allow the ASC to operate as a company ... when asked 'What sort of organisation would you expect the DMO to have looking after six submarines?', I said about 60 people. That would be my experience ... We found in total about 240. They were all involved in man-marking¹⁰ the activities of the DMO and trying to second-guess them and check them all the time.

The cultural survey would be an important tool for identifying the stress points in the enterprise and for cutting through the by now entrenched inefficiencies and roadblocks. The 665 responses received (a 75% response rate) provided some firm evidence for some—although not all—of the Phase 1 findings. The results showed that many of the problems identified by the review team in the first phase were also recognised by many of the participants (see Table 1). Despite that level of awareness, organisational inertia had locked in poor outcomes in the absence of strong leadership and agreed goals. In his foreword to the report, Coles emphasised the cultural factors required for success and flagged the focus of the remediation efforts that would follow:

In my experience, for any complex military project to be as certain of success as is possible, three key enablers are required; political leadership, adequate resources, and committed people, truly held to account.

In order to move forward it is necessary to establish a viable and comprehensive program that concentrates only on the essentials: governance; maintenance management and [the] supply chain; establishing realistic milestones; empowering those individuals charged with delivery; and finally holding them to account, whether in the Royal Australian Navy, Public Service, or Industry.

Table 1: Cultural survey results mapped against the Phase 1 findings

Finding	Evidence?
Poor availability caused by crew shortfalls, lack of spares and unreliable equipment.	Yes
Strategic leadership lacks cohesion	Yes
The RAN, DMO, Finance and industry not acting collectively as an 'enterprise'	Yes
Lack of clarity of accountability, authority and responsibility	Yes
Submarine domain knowledge thinly spread	Yes
Lack of robustness of the RAN's contribution to manning and sustainment	No
DMO tends to seek direct involvement at the tactical level	No
Performance-based ethos yet to be embedded in the ASC	Yes
No long-term strategic plan for efficient asset utilisation	No
Unclear requirements and unrealistic goals	Yes

Everything else essentially relies on those cultural issues being successfully addressed. For example, the reforms intended specifically to address the governance, leadership and management issues discussed below all relied on a common sense of purpose and goodwill among the constituent organisations.

Root causes of the problem

The review identified 20 key issues that the team believed were driving the underperformance of Collins-class sustainment. Each of those was the subject of one or more recommended steps for direct remediation, but those issues were largely symptoms of underlying root causes, of which the Phase 2/3 report identified five. The discussion in this section will focus primarily on those root causes, which largely fall into the ‘humanities’ category. (Interested readers can consult the report for a detailed breakdown of the many consequent flow-on issues.)

The five identified root causes were:

1. unclear requirements
2. lack of a performance-based ethos
3. unclear lines of responsibility
4. poor planning
5. lack of a single set of information to inform decision-making.

Formulating a high-level requirement


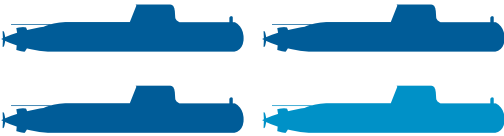
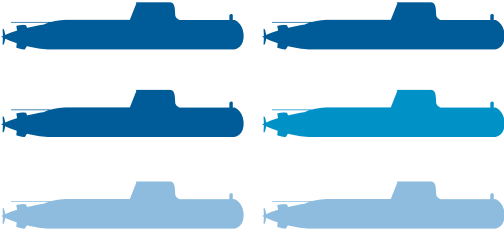
Coles and his team knew that the entire reform package they were developing had to have one clear objective—the submarine availability goal—that was shared by the enterprise leadership and articulated clearly to all involved. When the review commenced, there was no unclassified statement of requirements for the submarine fleet, even of a general nature, that could be shared with the wider workforce. In conjunction with the Navy, the team developed an unclassified operational objective, which was promulgated by the Navy after the internal Phase 2 report in the middle of 2012 recommended it do so. The requirement can be stated very simply:

There should be two submarines ready to deploy at any time and two in deep maintenance, and the other two should either be available or be able to be made available at short notice.

That statement shouldn’t have been surprising to defence professionals, as it conforms to the well-known ‘rule of thirds’—a heuristic for military forces that says that a third of the force should be available for operations at any time (Figure 1).

That level of availability can also be characterised by a requirement to have three submarines available for tasking at least 90% of the time—‘a level that the Collins class should be capable of meeting’, according to the report. But, when the report was issued in November 2012, the two-boat availability figure was around 70%, while the three-boat number languished at about 25%. (And even those low numbers were a significant improvement on 40% and 10%, respectively, a year earlier.)

Figure 1: A graphical representation of the RAN’s high-level availability requirement

 <p>Assured by...</p>	<p>Two deployable submarines consistently available.</p>
 <p>Underpinned by...</p>	<p>Four submarines in-service with the Fleet Commander. Three submarines consistently available for tasking, with one in shorter-term maintenance.</p>
	<p>Six submarines in the fleet. Two in long-term maintenance and upgrade.</p>

Source: Phase 5 *Beyond benchmark* report.

Performance-based ethos

As Phase 1 had identified, the entire enterprise lacked a sufficient focus on performance and outcomes. That was perhaps most obvious at ASC, since submarines were conspicuously spending too long in its yards and were too prone to developing defects at those times when they were available to the Navy. And, lacking a connection between payment and outcomes, the contractual arrangements between the DMO and ASC did little to address that.

But those were far from the only problems. The review found that, while the formal arrangement between the Navy and the DMO—a ‘materiel sustainment agreement’ in Defence parlance— contained some performance indicators (such as MRDs to be delivered), it lacked clarity on how the Navy could hold the DMO accountable if the targets weren’t met. Similarly, although the Navy necessarily had a role in onboard maintenance, there was no clear line of responsibility for those tasks or performance measures.

Some of those issues were well on the way to remediation even before the Phase 2/3 report was published. A new agreement between the RAN and the DMO was developed. A new materiel sustainment agreement for the 2012–2014 period contained clear performance requirements and established the responsibility on the DMO to deliver MRDs for a given budget. On its side, the Navy now had an obligation to supply crews for those days, as well as onboard maintenance support. And a new in-service support contract (ISSC) between the DMO and ASC was explicit in providing performance goals that were aligned with the overall availability requirement.

Those new arrangements also allowed the Department of Finance, as the shareholder in ASC, to introduce a new performance-management framework for the business. It would prove to be an enduring model. Since the Coles review, there have been multiple iterations of the ISSC, and the arrangement has been used as a vehicle to steadily improve outcomes and to retain the outcome focus. Stacie Hall from Finance explains that:

... the first one was put in place, and it had a target cost incentive with a little bit of pain share and gain share. And it linked to MRDs and some of the other elements of performance that Coles had mapped out. And I think we’re up to the fourth iteration of the ISSC now and the performance incentives are progressively tightened to incentivise ASC to continue to improve delivery.

Lines of responsibility

Not surprisingly, given the lack of mechanisms for accountability in key agreements, the review found that key roles and responsibilities within the enterprise weren't clearly defined or understood by either organisations or individuals. As a result, duplications and gaps in responsibility had developed over time, particularly between the DMO and ASC. On the engineering side, there was nobody who had the authority to manage the configuration of the submarines and direct sustainment efforts. Two recommendations were intended to address those shortfalls. They allow for an interesting comparison. One, 'to develop a clear line of authority for the design intent', was almost immediately implementable, with that responsibility now residing with ASC.¹¹ The other, for the Navy to 'develop and implement a plan to resolve loss of naval engineering skills', is a perennial problem that continues to this day. (A shortage of engineering expertise also reared its head in the near contemporaneous collapse of the Navy's amphibious lift capability.)

Some of the recommendations were *ad hoc* in response to observations, but there was a strong analytical thread as well. Deloitte's value-chain work resulted in an end-to-end breakdown of activities and outputs in the life cycle of submarine sustainment. There were 22 steps in the chain, grouped into seven main categories (Table 2), each with associated outputs. Some of the steps had two organisations with shared responsibility and one (setting the sustainment objectives, asset management and contracting) had three—the DMO, the RAN and ASC.

Table 2: Value-chain categories

Category	Key value-adding steps
Develop capabilities	The addition of new capability to upgrade existing or replace obsolete assets that deliver capability to the RAN
Preparedness	Activities that translate government policy and the operational needs of HQ Joint Operations Command (HQJOC) into clear requirements for the sustainment business, including master planning
Strategy	Activities that set the direction and goals of the sustainment business and manage performance to meet RAN's, and ultimately the government's, requirements

Category	Key value-adding steps
Planning	Activities that consider operational requirements and sustainment strategies to deliver detailed scheduling plans and for sustainment activities specifically focussed on maintenance
Sources and materiel supply	Activities relating to the establishment and management of supplies through to provision of assigned parts and services to complete sustainment activities
Upgrade and maintenance	The key activities that ultimately upkeep, update and upgrade through installation of upgrades and conducting maintenance on existing assets
Testing and certification	The final activities in the value chain that ensure the materiel contributions to capability are fit for use by the RAN and HQJOC

Source: Phase 2/3 report.

Once the value chain was complete, the team could then align responsibilities along the chain to better reflect the work being executed. The team wrote that the:

... important consideration is the ownership of each of the initiatives. Good practice suggests that ownership of the initiative should reside with the agency responsible for the execution of the relevant activity. Where shared responsibility is desirable, then coordination is important and needs to be carefully managed through a program office. This will be addressed during implementation.

The analysis resulted in a number of steps changing ownership, and some being rationalised (Table 3) For example, the DMO would take sole responsibility for the step previously shared with the RAN and ASC. There were also functions properly belonging to the RAN that the DMO had previously been taking the lead on, but perhaps the most noticeable change was a considerable shift of responsibility for hands-on shipyard activities away from the DMO, responsibility for which was mostly passed to ASC and industry partners. The rationale for that was explained in the report:

The DMO’s current high involvement in the execution of planning, supply and upgrade and maintenance functions instead of providing a support role undermines its ability to effectively execute its primary role as the ‘intelligent buyer’ under the ISSC.



Table 3: Number of activities before and after realignment, by lead agency

	Before realignment	After realignment
DMO	8	4
RAN	6	8
ASC	9	11
CDG ^a	2	2

a CDG (Capability Development Group) was an organisation inside Defence responsible for the scoping and planning of future ADF capability.

Planning

As will be discussed in the following sections, the original planning for Collins-class sustainment was poor, and the arrangements put in place would have resulted in substandard performance even if the enterprise had been ticking over smoothly, but that was far from the case, further exacerbating the intrinsic problems. The review found that planning problems flowed from the lack of a high-level requirement, which in turn meant that there was no obvious mechanism with which to drive a coherent management approach. Lower level maintenance plans and operational plans were being developed in isolation, rather than being managed as a portfolio. And the problem went down as far as the management of parts and other materiel. The lack of application of an asset-management strategy led to obsolescence, shortages of spares and a lack of reliability. Even within the Navy, there were multiple channels for the supply of parts.

The recommendations for remediation included some steps that really should have been in place years earlier, including the development of an asset-management strategy and a plan to implement it. Asset-management information was bread and butter to Bob Platfoot, who commented that some of the standard practices in big-project management in the private sector weren't being followed in the Collins-class sustainment enterprise. In particular, the sharing of data between the Navy (and the DMO) and ASC was not best practice:

Navy has spent a lot of money on information systems but has never required that their primary contractor use their systems as the main data source for asset management. They allow the contractors to use their own information systems and simply require a transfer of data into Navy systems. That is anathema in Australian industry. We don't do that. If you work for BHP or you work for a large manufacturing company as a contractor, you will provide information into their system as the primary to control costs and work and all the rest of it. And that ensures that the asset owner, the equivalent of Navy in this case, has all the

important information about the configuration, the work history, the sparring, the maintenance strategies, the overhaul strategies. Everything's in their system.

A single set of information

Platfoot's observation was consistent with observations of a wider problem. Anyone who's ever worked in Defence—or for that matter pretty much any large organisation—will be aware of the problems engendered by having a large number of information systems that have been acquired and developed at different times for different purposes. The Collins-class sustainment enterprise was no exception in that regard. The review observed that:

The Collins Class Sustainment Program is not in a position, from an information perspective, to make optimised long-term decisions. There are multiple systems and datasets in use for financial, maintenance and supply chain activities. In many cases these are not linked, resulting in data integrity issues. The lack of a 'single version of the truth' means decisions are unlikely to be consistent or accurate.

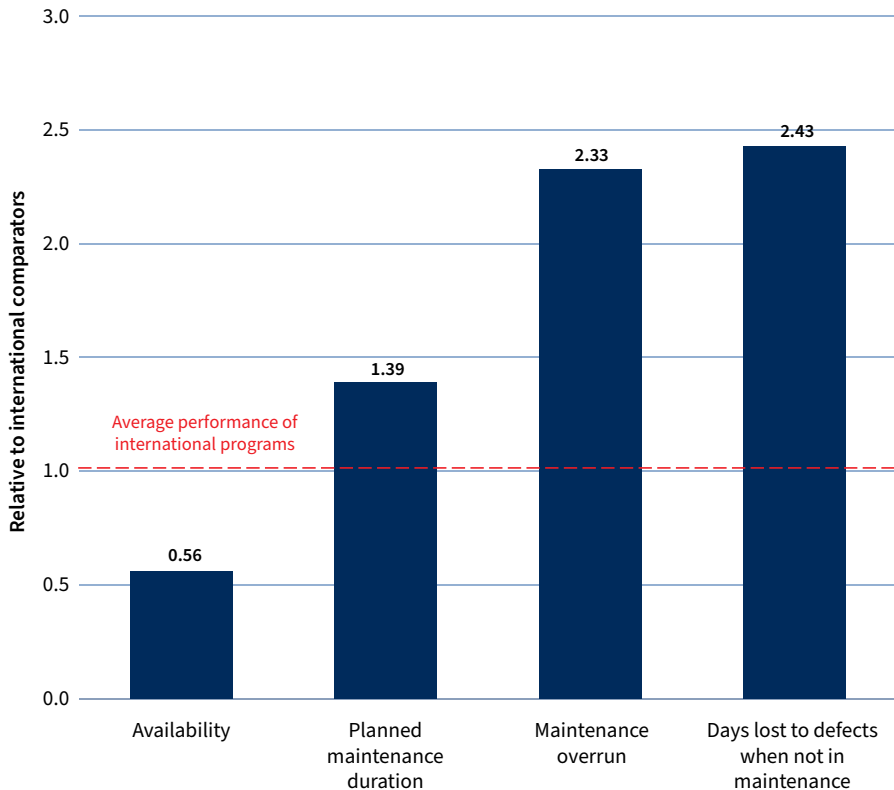
One of the recommendations is also likely to be applicable to any large-enough organisation. The review thought there should be 'enterprise-wide IT and information management strategies'. An overall integrated IT infrastructure is probably something of a lost cause in Defence, given the scale of its networks and the many legacy issues to be managed, but a coherent approach to information management is workable within the submarine enterprise provided that everyone agrees on what information is to be collected and how it's communicated.

The international benchmarks

The international benchmark work was important for understanding what might reasonably be expected from the Collins class. The high-level availability requirement developed in Phase 2 and promulgated by the Navy wasn't pulled out of thin air. The international benchmarking work showed that other navies were capable of producing that level of availability from their fleets. When compared with Australia's performance, it further highlighted how moribund the local efforts had become.

Figure 2 shows the performance of the enterprise prior to the start of the remediation program. Submarine availability was just over half of the international benchmark figure. Significantly, overruns in maintenance times and days lost to defects when not in maintenance (that is, things going wrong during the operation of the boats that required a return to port) were both running well over 200% of the benchmark, indicating a very poorly performing sustainment chain. The ultimate goal was clear: the enterprise would be running with average efficacy if all of the columns in the table were near 1.00. (Since the benchmark figure represented an average outcome, several of the comparator nations were presumably doing better still.)

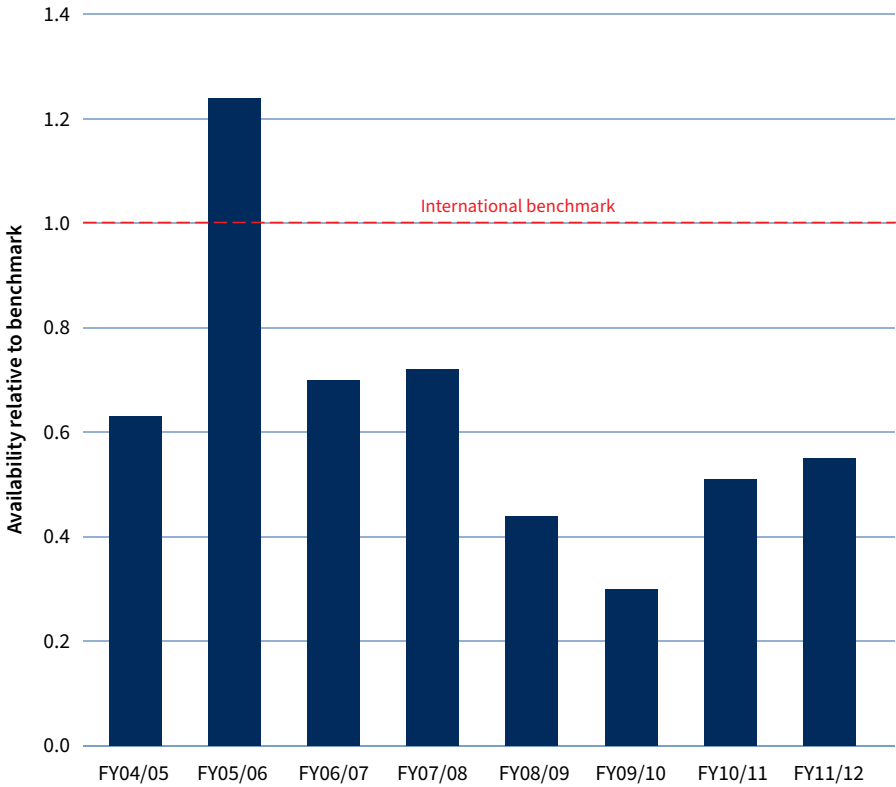
Figure 2: Collins class availability and maintenance performance relative to the international benchmark



Source: Phase 3 report.

For a fleet of six submarines, the benchmark figure translates into approximately 1,200 MRDs per year. At 56% of that figure, or 672 days, the Chief of Navy was being annually short-changed almost half the availability that he could have reasonably expected. And those sorts of numbers had by then become the norm (Figure 3). The team found that the shortfalls were due to a combination of systemic issues (the planned maintenance periods were excessive by international standards) and by poor mechanical reliability of the submarines and their systems, and the number of defects while in service tended to increase over time. The latter issue was ascribed to poor quality of maintenance activities and poor management of obsolescence rather than intrinsic design problems with the boats.

Figure 3: Collins class availability relative to the international benchmark, 2004 to 2011



Source: Phase 3 report.

It wasn't possible to benchmark the cost of Collins-class sustainment relative to the international comparators because of the wide variance in accounting practices among the nations,¹² but the review was able to quantify the cost of each MRD. In the 2011–12 financial year, each MRD was costing \$1.2 million, which was an increase of 50% on the same measure in 2005–06. The modest improvement in availability shown in Figure 3 had come at a significant cost.

A short digression about Australia's defence capability planning is in order here. While not as egregiously over the benchmark as the other performance measures, the 39% excess of planned maintenance duration relative to international programs is notable because it shows that a significant level of underperformance relative to best practice was planned in from the start. In fact, as will be explained below, changes to maintenance scheduling actually gave a better return in terms of availability than fixes to maintenance performance. That of course raises the question as to how that

situation could arise in the first place. It seems that poor planning of support was a feature of the Collins program from its early days. In a case of history at least rhyming, Paul Greenfield had been asked to develop support arrangements for the Collins as early as 1993, around the time that HMAS *Collins* was nearing completion. But the Navy's Support Command and the Defence Acquisition Organisation (the 1990s precursor to the DMO) largely ignored the resulting advice and instead adopted an *ad hoc* approach to Collins support that essentially negated any prospect of a systematic approach and set the course for later problems to develop.¹³

As well, further deterioration over time was a likely outcome because entrenching peaks and troughs into the workflow renders workforce management more difficult. And the poor performance in Collins-class sustainment was far from a one-off in ADF asset management—other assets have been introduced to service with inadequate support arrangements and have suffered the same poor outcomes.

Moving forward but feeling the strain

Getting to the end of the Phase 2 and 3 work was probably a huge relief to the review team, which was by then showing signs of stress and fatigue. As well as being a huge amount of work, the review had become complicated enough to present its own management and coordination issues. At its peak, there were 50 people working for the team, and multiple subcontracts that also had to be managed. And, when interacting with the leadership of the submarine enterprise, the team was often dealing with busy and stressed people who, at least at first, had been entrenched in their views as to what was wrong and which other parties were to blame. That took its toll. Coles says of the time that he found it:

... physically very tiring. My children were quite concerned about my health and my mental wellbeing at times, because it's quite stressful. My job was to often tell people, very senior people, 'You're completely wrong. You just don't understand.' That's quite difficult to do nicely, but actually that was often the case when I had one-to-ones with the senior people.

Coles wasn't alone in feeling the strain, and not all of the team would continue in the role: during 2012, Fred Scourse decided that he'd had enough and headed back to the UK to retire. Stephen Smith was sorry to see him go, describing him as an 'unsung hero who was very instrumental in making sure the review was a success'. Despite the toll it had taken, Scourse was happy with the part he'd played, telling Smith that the team had 'sweated blood over [the review] and it has been a really difficult thing ... a big all-consuming effort that has really taxed me. But we've cracked it.' Greenfield recalls that Scourse was unwilling to continue being caught up in hostilities between the various players, being particularly stressed by the behaviour of the DMO towards the review process, saying that he was 'not going to work with these people'.

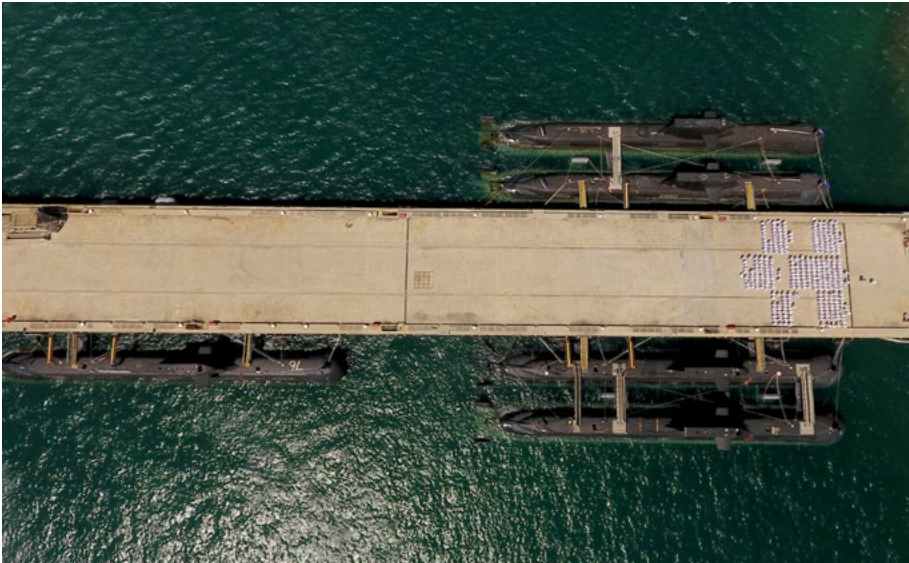
But the work had not yet finished. Identifying the problems and producing a detailed map of the value-adds throughout the enterprise were only steps towards the end goals. The final push, which flowed directly from the Phase 3 work, was to get the enterprise onto the road to transformation and to get the availability of the submarines trending upwards.

Coles had always believed that success was possible. Now he perceived that the necessary elements were in place. The declassified Phase 2 report sounded an optimistic note:

Strong political leadership is clearly present, considerable additional resources have recently been allocated, and I believe that the current senior leaders in Defence are strongly committed to resolving the longstanding problems surrounding the Collins capability they have inherited.



If three submarines in Cockburn Sound is a sight to warm the heart of the Chief of Navy, then four is even better. Under the revised sustainment model, four submarines should be available much of the time. Here HMAS *Collins*, HMAS *Farncomb*, HMAS *Dechaineux* and HMAS *Sheean* are in formation in 2019. (Photo: Department of Defence, [online](#)).



And sometimes there will be five boats in the water at once, albeit briefly, as one of those will generally be scheduled to be lifted out for maintenance. Here, there are five submarines alongside Diamantina Pier, Fleet Base West, with submarine crews, Submarine Force Headquarters, and additional submarine support staff. This photograph was taken in 2016, at about the time that best practice availability was achieved. (Photo: Department of Defence, [online](#)).



One of the benefits of being able to rely on submarine availability is the ability to plan exercises with allies and other partners. Here, US Navy submarine USS *Santa Fe* transits in formation on the surface with RAN Collins-class submarines HMAS *Collins*, HMAS *Farncomb*, HMAS *Dechaineux* and HMAS *Sheean* in the West Australian Exercise Area in 2019. (Photo: Department of Defence, [online](#)).



John Coles speaking at ASPI's 2014 SUBCON conference. In his address, which was titled 'Lessons from the past', he discussed many of the issues described in this volume. In the same session, David Gould, then General Manager Submarines in the DMO, spoke on 'Submarines: project management'. The talks may be viewed on ASPI's YouTube channel. (Photo: *The Strategist*, ASPI, [online](#)).



Then DMO General Manager Submarines, David Gould (right) and Chief Executive Officer ASC, Steve Ludlam (left) in the control room of HMAS *Sheean* with marine engineering officer Lieutenant Commander Lindsay Gordon in 2013. By this time, the Coles review reforms were well on the way to implementation. The two guests embarked in *Sheean* for an overnight sea ride to familiarise themselves with life on board a Collins-class submarine. (Photo: Department of Defence, [online](#)).



Minister for Defence Stephen Smith answers questions from the media during his 2013 visit to ASC. On the left is David Gould, then General Manager Submarines in the DMO. The improved Collins-class maintenance performance would allow the minister to start serious progress on the program to produce the replacement class of boats. (Photo: Department of Defence, [online](#)).



As well as exercising with other navies, Collins-class submarines are frequently involved in activities with other elements of the ADF. Here, a Collins submarine and an RAN MRH-90 Taipan helicopter practise transferring personnel to rotary wing assets while underway in a 2016 exercise. (Photo: Department of Defence, [online](#)).



Training also extends to the submarine's role in anti-surface warfare. Here, HMAS *Dechaineux* is being loaded with training torpedoes on the ammunition wharf located at the HMAS Stirling base in Western Australia. (Photo: Department of Defence, [online](#)).



Occasional live-fire exercises demonstrate the lethal effectiveness of the Collins-class submarine. HMAS *Torrens* (DE 53) was a River-class destroyer escort of the RAN. *Torrens* entered service in 1971 and was active until her decommissioning in 1998. The ship was sunk by a torpedo fired by HMAS *Farncomb* in June 1999. (Photo: Department of Defence, [online](#)).



ADF assets also have to be able to deal with potential adversary submarines, making training in antisubmarine warfare (ASW) essential. In a 2021 exercise, this photo of the frigate HMAS *Anzac* and its embarked MH-60R Seahawk helicopter was taken through the periscope of HMAS *Rankin* during an ASW training activity. (Photo: Department of Defence, [online](#)).



As well as their war-fighting role, Australia's submarines play a role in representing the RAN and the nation at international events. Here, HMAS *Farncomb* sails with naval ships from around the Indo-Pacific region during the Japan Maritime Self-Defense Force's International Fleet Review 2022 off Yokosuka, Japan. (Photo: Department of Defence, [online](#)).



ASC maintains two major facilities for Collins-class sustainment work. Full-cycle dockings are performed at its facility in Osborne, South Australia, photographed from the water in 2021. (Photo courtesy ASC).



ASC's other facility is at Henderson, Western Australia, seen here from the air. The ship lift used to raise submarines onto hardstands for maintenance work is in the centre of the photo. (Photo courtesy ASC).



Although controversial at one time, it is now standard practice at ASC to cut the hull of a submarine undergoing a full-cycle docking. (Photo courtesy ASC).



Removing the major systems from the submarine allows them to be worked on in a more spacious environment than is possible within the hull. As well, it's possible to fit already refurbished replacements, facilitating a faster turnaround by managing a stock of spares rather than delaying the return of a boat to service until its 'own' systems can be returned. (Photo courtesy ASC).



Cutting the hull allows easier access to major components such as the diesel engines and, as seen here, the electric motor. (Photo courtesy ASC).



With refurbished components reinstalled, the hull can then be rejoined and welded as part of the process of returning the boat to service. (Photo courtesy ASC).



The size of a Collins-class submarine is well illustrated by this photo of a boat undergoing maintenance at Henderson, Western Australia. (Photo: Department of Defence, [online](#)).

Chapter 4: Planning and implementing reform (phase 3)

The fourth substantial deliverable by the review team was an implementation strategy¹⁴—a document that drew on the findings of Phase 2 with a focus very much on the future of the submarine enterprise. Even at that late stage, the reasons for the rundown in the performance of Collins-class sustainment were still not entirely clear to the team. Greenfield says that Coles would often ask him ‘How did it get to this?’, for which he had no adequate answer, perhaps reflecting less than perfect coordination of record keeping across the multiple entities involved and the lack of an overall information-management strategy. But ultimately it was a question that didn’t need to be answered, given Coles’s aim of focusing more on the future than the past and avoiding assigning blame. In fact, he saw fit to provide a further warning in his foreword to the implementation strategy:

A transformation program is very unlikely to get off to a successful start if an atmosphere of a blame culture persists. It is important not to conduct ‘witch hunts’; the current situation has almost certainly arisen due to numerous factors and decisions that occurred in the past. An atmosphere of blame will not encourage individuals to take the risks necessary ...

The implementation strategy: transformation

In its own words, the implementation strategy wasn’t a plan for the execution and delivery of remediation, which would be a follow-on activity for the enterprise itself to develop. It’s more accurately described as a ‘transformation strategy’—a point the authors make in the foreword, writing that ‘its fundamental aim is to provide a route map to move from the “as is” (a seriously underperforming sustainment enterprise) to the “to be” (one attaining [the] international benchmark).’ The review team made it clear that remediation wasn’t simply an exercise in fixing existing arrangements. Instead, getting to the required standard would necessarily entail a rigorous implementation of a complex set of overlapping recommendations that fundamentally changed the relationships between stakeholders.

With that in mind, the team was careful not to promise quick fixes or to downplay the challenges. Reading the strategy today, it seems that there was some apprehension among the review team that a reversion to the maladaptive practices of the past was entirely possible if not carefully guarded against. It’s worth quoting the foreword at length before unpacking some of the important features of the strategy:

Successful transformation plans are difficult to deliver... [T]hey require decisive leadership and internal management arrangements that do not confuse ‘delivering the day job by hard-pressed line managers’ with ‘managing the changes’. For the Collins class the transformation is not a ‘big bang’ but a continual series of small and numerous steps—some ‘enable’, some ‘sustain’ and some ‘deliver’. It is probable (but has not been demonstrated by the review team) that the loss of availability of the Collins class was indeed incremental and therefore not that surprising that restoration follows the reverse process. The current organisational structures for sustaining the Collins class inside the DMO will need significant realignment of roles and responsibilities to deliver the transformation.

Six key factors of success

The implementation strategy contains a mixture of what could be described as cultural and technocratic recommendations. Not surprisingly, given what’s been documented in previous chapters, a significant overhaul of organisational responsibilities was foreseen, informed by the value-chain work that formed a major part of Phase 2. The cultural findings from the two earlier phases were also at the front of mind, not least the survey result that revealed that fewer than 25% of DMO, ASC and RAN respondents agreed that they trusted their leaders in times of change. That presented a particular challenge for implementation, given that major changes were needed across the enterprise.

The strategy identified six critical success factors:

1. clear accountability, responsibility and authority
2. prioritisation and management of scarce resources
3. a new culture
4. governance and leadership
5. monitoring performance
6. persistence.

None of those would surprise anyone who’s ever sat through a facilitated corporate workshop, and they’re much easier said than done for most organisations. So the question is: why did they work in this case?

One answer probably lies in the depth and methodical nature of the review work. This wasn’t a case of corporate-speak platitudes from consultants with only a superficial understanding of the business. Behind each of the generic-sounding factors was a solid understanding of the workflows, as well as practical recommendations for implementation from a team with more experience of the business than most of the incumbents. Another likely factor in its success is that

there was clearly a collective desire for a better outcome. When presented with something that looked like it could work, most participants were prepared to make a good-faith effort. And, despite the reservations of some participants about the value of elements of the Phase 2 work described in the previous chapter, the value-chain and other datasets collectively made a coherent and detailed case for change that was hard to dispute.

Out with the bad culture, in with the good

As was explained in the discussion of the Phase 1 findings, almost all of the criticisms of the functionality of the submarine enterprise centred on cultural and organisational issues. As was readily established by the ‘first look’ review, the hardware was in reasonable shape. Consequently, there was a focus on culture, leadership and governance in the identified success factors; nothing was likely to change for the better until roles and responsibilities were better defined and good working relationships were established. The required culture was described in terms that are again common in most corporate planning exercises:

- There’s a compelling vision in which everyone in the submarine enterprise can rally around and work towards.
- People understand why change is required and are convinced that it needs to happen immediately.
- Leaders demonstrate the right behaviours and values that are needed to lead and implement successful transformation.
- Transparent and open two-way communication is common practice.
- People have the right levels of skills to accept and sustain change.

A key difference from what might be termed ‘generic’ consultation exercises is that Coles and his team offered a practical set of implementation steps and recommended actions to realise those broad descriptors. Paul Greenfield, who along with Arthur Fisher is credited by John Coles with having done the lion’s share of writing up the implementation strategy, draws a distinction between the Coles review and its near-contemporaneous Rizzo review of naval engineering:

It wasn’t just us saying ‘You need to change your culture.’ We were saying that ‘You need to do this. You need to do that.’ It was not like the Rizzo review. It was actually a practical solution to the problem. And, and when they did it, they started to see the results and they became comfortable. And so they want to do it some more.

A major focus of the revised governance and organisational structures was the newly established position of General Manager (GM) Submarines—a role within the DMO with responsibility for ‘all materiel-related aspects of submarine support

across Defence'. The GM Submarines had a pivotal role in the transformation process, chairing the transformation program board and receiving advice from a transformation management office that was newly constituted. The office would be staffed with personnel drawn from all of the key stakeholders—the RAN, the DMO and ASC—each of which would have its own subordinate program office.

Within the DMO, the GM Submarines would have a separate support structure, and the review made it clear that the focus at all times must be on outputs, not internalities. The responsibilities of the office would include not only the Collins remediation efforts and ongoing sustainment activities, but also activities to scope and define the future submarine that would eventually replace the Collins.

The transformation also included the transition of ownership of some of the value-chain steps, as discussed in the previous chapter. Of course, changes to organisational charts are easy to design. Every major review of Defence (and there have been a great many over the years) involves a revised set of reporting and administrative structures, but the results are rarely as dramatic as they would prove to be in this case. That's a testimony to the thoroughness of the planning and to the willingness of participants to do what was needed when faced with solid evidence.

'A thing of beauty'

Consistent with their approach from the start, Coles's team quantified both the inputs and the outputs of the strategy wherever possible. There were measures of effectiveness by which success could be accurately assessed, and little in the way of wriggle room if those measures didn't improve. Of course, the most important such measure was submarine availability. As we've seen, Australia's submarine sustainment performance was well below international standards.

Clearly, that needed to change. The review concluded that the greatest improvements in overall effectiveness would come not from tightening up overruns in maintenance times or reducing the number of unexpected defects (although both of those needed to improve) but from reducing the planned maintenance time. Overall, an 80% improvement in MRDs was required, and fully two-thirds was expected to come from reducing the planned time for maintenance. The other factors would collectively contribute the other third of the improvement. And preferably all of that would happen without throwing large amounts of money at the problem—which might in any case have proven problematic, given the optics on submarine capabilities at the time.

An arrangement that allowed the smoothest possible workflow in the yards, allowing ASC to allocate resources in a sustainable fashion, needed to be found, and the review team came up with a most elegant solution in the form of the '10 + 2' usage upkeep cycle (UUC). Each submarine would have a 10-year operation period, including

one 12-month mid-cycle docking (MCD) and a couple of six-month intermediate dockings, and then go into a two-year FCD (see box). The most salient feature of the UUC is that it has only one submarine in FCD at any given time, and one other submarine in either MCD or intermediate docking. The other four submarines would be available for tasking, except for relatively small down periods for *ad hoc* repairs.

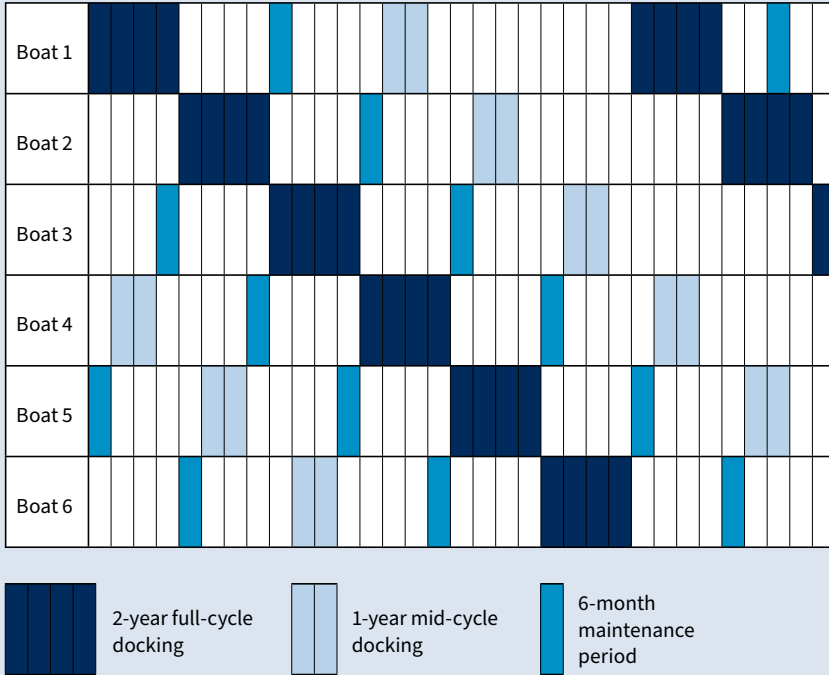
The ‘10 + 2’ maintenance cycle

Since the overall aim of the submarine enterprise was to provide the Chief of Navy with the stipulated number of unit-ready days, the necessarily long periods of unavailability due to the maintenance requirements for the safe operation of the submarine fleet had to be managed carefully. The model that the Coles review produced allows for the availability of four boats most of the time (given the vagaries of submarine operations, there will unavoidably be times when short-term problems take a boat or two offline temporarily). The model entails 10 years between two-year periods of major overhaul and refurbishment work (FCDs). In between FCDs, there are a one-year MCD and two intermediate maintenance periods of six months each. So, in each 10 + 2 cycle, a submarine is available to the Chief of Navy for training or operations for eight years.

The model sequences Collins support to ensure that only two boats are in longer term maintenance at any given time—one undergoing an FCD (in Adelaide) and another undergoing either an MCD or a six-month intermediate docking (in Western Australia). In this way, four boats are continuously available for operations, so the Navy has a steady availability of sea days to plan training and operations around. And there are two maintenance teams continuously occupied, with no peaks or troughs in the workload (Figure 4).

The 10 + 2 cycle is the ideal model for a fleet of six submarines. Importantly, the cycle works because $10 + 2 = 12$, which is a multiple of six. In fact, the plan for Collins maintenance at the time of the delivery of the boats was based on an 8 + 3 model, which doesn’t have the same arithmetic and which pretty much guaranteed peaks and troughs in maintenance and therefore availability. At various times, there would be periods of having one, two or three boats in FCD or MCD. And the situation was likely to become worse over time, as ASC struggled to manage and retain its submarine workforce as the work ebbed and flowed. That’s exactly what transpired, and the inefficient 8 + 3 output proved impossible to achieve in practice. The result was that some submarines sat in maintenance (or, worse, largely untouched) for years at a time. For example, HMAS *Collins* was offline for five years from 2012 to 2017.

Figure 4: The Coles 10 + 2 duty cycle for the Collins in six-month time increments



Source: ASPI.

That compares with the previous ‘8 + 3’ cycle, which gave—at best—eight years with the same 12-month and two times six-month downtimes, followed by a full three years offline for an FCD. And, as well as providing for a shorter operational period, the 8 + 3 arrangement couldn’t operate in a steady-state manner when used to maintain a fleet of six submarines. At various times zero, one, two or three submarines could be in various stages of maintenance, with concomitant impact on workflows in the ASC yards, budget requirements and Navy crew levels.

The net effect of the move to 10 + 2 was to reduce the total time of submarine maintenance over the boats’ life cycle and to further spread the maintenance performed over a larger number of shorter periods. The reasoning was that more frequent attention would head off the development of larger future problems—described as a ‘stitch in time saves nine’ philosophy. That would also bring Australia into line with the international benchmark comparators:

The movement to a 10+2 UUC will give the Collins class a better balance between the time spent in deep maintenance and the time spent in in-commission maintenance. Currently the class spends 70% of its planned maintenance (as defined by the current 8+3 UUC) in FCDs ... [compared] with an average of other comparator navies of 49% ... The data suggests that less maintenance done more often is a more effective maintenance program.

It's important to note that there's a tight link between the 10 + 2 model for sustainment and the high-level requirement for two boats always available, two more on short notice and two in maintenance. According to Greenfield, it was Arthur Fisher who took the broad concept and produced the practical implementation for Australia's six submarine fleet, subject to the high-level requirement illustrated in Figure 1: 'I watched as he doodled it. He was trying to see if there was a way to level-load industrial resources and [submarine] operational availability.'

Fisher's mapping of availability to FCD timings was described by ASPI's Mark Thomson as 'a thing of beauty'—a phrase not often found in discussions of heavy industry. But it was a success, and the RAN was very supportive of the arrangement once it understood that it allowed budgets and plans to be properly drawn up years in advance, including for scheduled maintenance, reliability and obsolescence updates and upgrades. Also, Navy crews knew where they were going to be years in advance; they could settle their families and enjoy a quality of life that was unobtainable before, and the absence of which was a cause of many of the issues that led to the Moffitt review into submarine crewing.

An ambitious time line

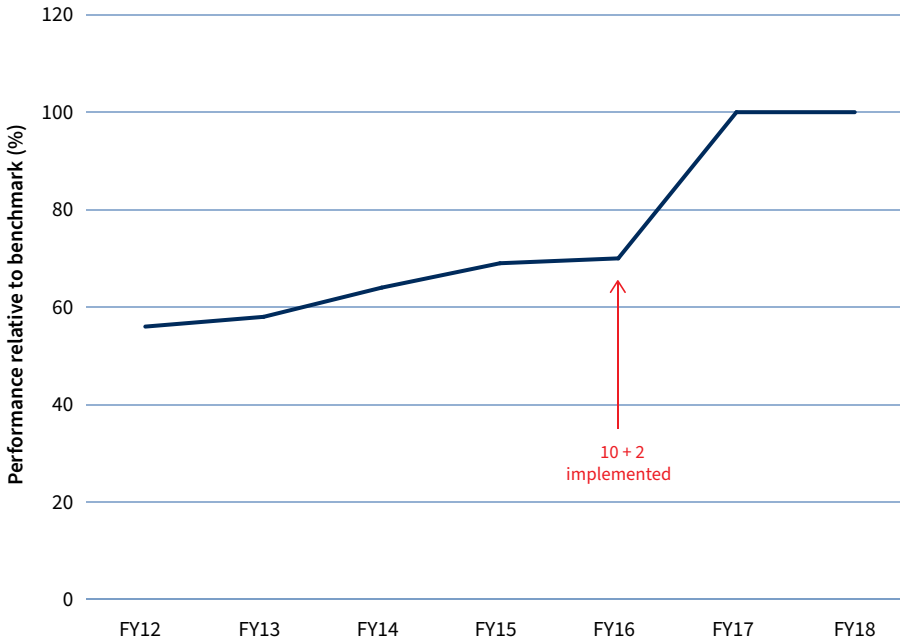
Even the move to the transformed enterprise was on a tight timetable, with 100 days each being allocated for detailed planning and preparations to be put in place, and for the actual transformation to be bedded down. It was an ambitious timetable, but that was probably smart. Defence has had many transformation projects over the years, and few of them have had lasting impacts on efficacy or efficiency, often because of the inertia of existing structures and processes. Moving swiftly made a lot of sense.

But major cultural and organisational changes of the type proposed by Coles's team rarely happen overnight; hence the inclusion of 'persistence' in the critical success factors. It's striking that the 2012 implementation strategy indicated that, even if the transformation process were to be successful, there would be only modest improvements in availability over the following four years: a significant increase in availability would occur only at the end of 2016, when the 10 + 2 UUC could be implemented.

Consistent with Coles’s focus on quantifiable outcomes, there was even a year-on-year estimate of the improvements that could be expected in the interim period. Figure 5 shows the expected benefits from the reforms, and by far the greatest improvement was expected in 2017. Because of that, the team felt compelled to urge the reforming enterprise to stay the course, writing:

Significant transformations require some short-term wins that nourish faith in the change effort, reward the hard workers, keep the critics at bay and build momentum ... [but] should not be targeted if there is the slightest danger that they will affect the overall transformation ... This is particularly significant for this transformation program as the achievement of MRDs will not be immediately apparent and diligence and persistence will be required to ensure that the MRDs are unlocked even though they may remain latent until the UUC can be optimised.

Figure 5: The 2012 projection of improvement in MRDs relative to the international benchmark in the post-review period



Source: Implementation strategy.

As we’ll see, those projections would prove to be unduly pessimistic, and short-term gains proved to be achievable and sustainable even as the longer term arrangements were being put in place. But there were good reasons to be cautious about what could be achieved quickly. As well as myriad organisational reforms and enabling steps, the remediation effort had to deal with the rundown in the availability of

the fleet and the backlog of maintenance work that existed at the time. There was considerable inertia—both organisationally and physically—in the submarines then sitting in maintenance facilities. Getting to the desired end state wasn't just a matter of putting new organisational charts and logistics arrangements in place and then cracking on with the 10 + 2 UUC. Those steps had to be done concurrently with getting boats that were in varying states of disrepair into an operational state and keeping them there, while juggling maintenance timetabling to finally ease into the desired long-term arrangement.

For example, HMAS *Collins* entered FCD in 2012, but didn't re-enter service until 2017 (a 60% overrun of the nominal three-year FCD). The plan was for FCDs to transition from a nominal three years duration (but often more in practice) to two years, with three successive two-and-a-half-year FCDs providing the bridge. The implementation plan made a virtue of the much-delayed HMAS *Collins* FCD to use it as a testbed for ideas for improving the efficiency of the deep-maintenance part of the cycle:

The goal is to create a complete work list, bill of materials, maintenance plan and detailed schedule for [HMAS] *Collins* that will allow FCD to be completed by the planned end date. [That] will provide a solid foundation for ... other platforms in subsequent dockings.

It should be noted that, even if the maintenance arrangements could have been fixed quickly, the Navy wouldn't have had enough trained crew members to operate them. It isn't a part of the central story for this volume, but the uniformed submarine workforce had suffered a significant rundown in numbers and a loss of morale in the period immediately before and after the delivery of the *Collins* class. The welfare and training levels of the RAN's submariners were themselves the subjects of a separate review and parallel reform efforts. But, as per the fundamental inputs to capability framework, the personnel and major systems (in this case the submarines) both have to be fit for purpose. In submarine operations, there's an almost symbiotic relationship between the crew and the boat—each affects the other's performance. In this case, the feedback was negative: the Navy's attempts to redress its crew numbers and expertise problems were exacerbated by the lack of MRDs available for training, while a rundown of the submarine workforce reduced the incentive for the Navy to focus on getting more boats into the water.

The low cost of transformation

The implementation strategy contained the estimated cost of the transformation program: a relatively modest \$124 million spread over five years. In comparison, the total annual cost of sustainment contracts for the *Collins* class was over \$450 million at the time, so the cost of the transformation program amounted to a little over one-quarter of one year's sustainment cost, or an average of a 7% increase per annum over the four-year period.¹⁵ Of that amount, half was already funded under

existing initiatives, and the other half would have to either be reallocated from other activities or receive new funding.

If the change was successful, there would be a dramatic improvement in the overall cost-effectiveness of the sustainment effort. At the time of the review, Collins-class sustainment was costing Defence 'at least two times that of comparator navies', measured by dollar cost per MRD achieved. Even if the sustainment budget remained unchanged, then the cost/MRD would almost halve if the performance against benchmark levels could be improved from 56% to 100%, bringing it into line with the comparator navies' costs.

As is often the case with projects, there was a significant front-loading of the transformation costs: 76% of the total cost (\$89 million) was to be expended in the first two years and the remaining \$35 million over the following three.¹⁶ Because the team expected few significant returns on investment in the first three years, the emphasis on persistence as one of the critical success factors made good sense. Again, the solid evidentiary basis of the business case could be relied upon to soothe nervous stakeholders. As things transpired, the early reforms yielded better than expected results and probably paid for themselves in any case, but that couldn't be known when the organisation set out on the transformation.

The review team also expected that there would be some future savings of sustainment costs that would help offset the transition costs:

It is also reasonable to conclude that reduced time spent in maintenance will lead to reduced maintenance costs ... [W]ith superior planning, timely purchase of materials and greater utilisation of workforce (less waiting time) additional savings could be realised.

Even with those savings, the overall cost of the submarine program probably increased when the transformation program succeeded, given that additional sea days allowed for extra crews to be raised and trained and required the purchase of additional consumables such as fuel. That isn't a bad thing, of course, since Australia had decided that a fleet of submarines was an asset that helped provide for national security and had spent around \$10 billion on the Collins fleet by that point. But an increase in submarine costs would necessarily put pressure on the Navy and defence budgets. It's a perverse aspect of defence budgeting that owning an underperforming asset can help free up money for others.

Chapter 5: Success—the submarine fleet recovers

Transition: the emergence of an enterprise

Once the implementation phase began, things moved quickly. When asked whether implementation was a struggle, Paul Greenfield recalled that there was surprisingly little pushback:

I don't think it was a struggle once people realised it could be done. Everyone was all in at once. People just threw themselves into it. And, at the working level, whether it was Navy or ASC or even DMO making the changes, they all just threw themselves into it. Even the submariners saw the changes happening—you could see it on their faces. And I think that went up the hierarchy, and people further up the chain started to get comfortable with the idea that we can do this.

Ultimately, success had to be measured by the metric of improved availability, but there were earlier impacts as well, particularly as a mechanism for cutting through some of the cultural problems. In his new role as GM Submarines in the DMO, David Gould quickly discovered the difficulties engendered by the cultural issues that the Coles team had documented, particularly the poor working relationship between the DMO and ASC. Working to implement and then bed in the raft of reforms aimed at remedying those problems in a short time frame, he found the Coles review to be an important circuit-breaker in as much as it had forced the often warring parties to at least be responding to the same recommendations. And, crucially, it gave him measures of effectiveness that could be used to focus the attention of the groups that he had to coordinate:

They had to break the circuit. But doing the study wasn't enough, it also had to be implemented. So maybe once a month, I would have Finance, ASC and myself around the table, actually looking at each of the recommendations and making sure that progress was being made ... That made people work together who previously had not been really working. So I think that structure was providing that stimulus for me, and it was really beginning to break down the core relationships.

Empowering ASC

Everyone spoken to for the preparation of this volume agrees that the cultural shift was swift and positive. Perhaps nowhere was that change more welcome than at ASC. From a state of feeling under siege, as Sean Costello described, trust was slowly

gained between the parties as positive results began to emerge. ASC's then Manager of Submarines, Stuart Whiley (now the CEO and Managing Director), describes the process as an iterative one in which success built trust, which led to further successes:

[I]t was about creating a culture of collegial engagement, right through ASC, Navy and DMO, where everybody has a role to play that they understood and that they support one another in the outcomes ... [T]he results that we got from early engagements and initiatives started to turn things around and started to build trust. The enterprise is built on the confidence, the engagement and the trust we've built up by dint of performance, by delivering on the outcomes.

For its part, once empowered to take ownership of important aspects of maintenance, ASC was able to introduce some innovative workshop practices. Gone were the days of the DMO's people 'walking the floor at ASC' to keep an eye on proceedings. ASC also had the incentive of the new performance-based contract that replaced the previous cost-plus contract at the centre of so much dissatisfaction. As per the review's main recommendations, the key driver for the contractual arrangement between the DMO and ASC—and indeed for all of the other key parts of the enterprise—became the availability of submarine days at sea. Then ASC CEO Steven Ludlam recalls that the principle was easy to agree on, even if the negotiations on the details proved more challenging:

... the measure that we have to use is days at sea, to give [the Chief of Navy] trained sailors, and to give the military capability that government is asking you to deliver. So the ISSC was all about days at sea, and then the dollar component followed. You've got these days at sea divided by dollars, and that became the simplicity of it. Now the contract took an age to negotiate, with a million lawyers around it, on ramps, off ramps, goodness knows what else. But that was the simplicity of it. And Chris [Deeble] and I worked through that and put it in place.

Keyhole, or open-heart, surgery?

In the hands-on work in the shipyard, perhaps the two most important innovations were a radical change to the way in which the major components of the propulsion system—the electric motor and the diesel engines—were overhauled during FCDs and the configuration of a 'tower' arrangement around the submarine that allowed workers simultaneous access to the boat at multiple heights.

For some years before the Coles review, there had been sporadic arguments within the submarine enterprise about the preferred approach to work on the major elements of the propulsion system during FCDs.¹⁷ There were basically two schools of thought. One corresponded with the approach that had been taken with Collins maintenance up to the time of the Coles implementation period, which was to work on the system within the hull, dismantling any items that needed to be removed for

work and taking the parts through the relatively small hatches provided for access. It was a heavy engineering form of keyhole surgery. The other approach, which is now standard at ASC, more closely resembles open-heart surgery, in which the back part of the submarine is cut off, allowing major systems to be removed in their entirety for maintenance, replacing them with reconditioned parts removed from the previous boat to go through FCD. It's an approach adopted by some submarine operators around the world but is regarded with deep suspicion by others. Ludlam recalls the 'queasiness' regarding the practice that held back its implementation until the Coles transformations were in place, but it's hard to see what those reservations were based on. Submarines are initially constructed as a series of hull segments that are then welded together. Cutting a boat apart and then re-welding it when work is completed shouldn't present any greater challenges than the original build work done in the same yards. ASC probably understood the risks and benefits better than any of the other entities in the submarine enterprise. A two-year FCD wouldn't have been possible without the new approach, which ASC's senior naval architect, Glen Sloan, had been advocating for some time.

The maintenance support tower allowed much more work to be done proximate to the boat itself. It effectively provided a greater shop-floor area, reducing the need to move items around the facility after their removal from the submarine.

There was also a substantial reorganisation of other submarine-maintenance work practices that made ASC more efficient. The diesel engines, long a weak point of the Collins design, were no longer being adequately supported by their original supplier, and there was a long tail on the supply chain, with some components having to come from Europe. ASC took over many of the functions previously sourced externally, including organising the manufacture of components in Australia. Similarly, some critical issues involving the generators and motors were resolved through local innovations.

Putting the plan into practice: three years becomes two

Collectively, the changed work practices allowed the FCD process to be reduced to two years as opposed to the nominal three-year interval (though in practice always longer) that had previously been the norm. ASC's Sean Costello put the changes down to the freedom from constant detailed oversight, allowing the contractor to focus on its core role. The ASC workforce responded positively to the changes. Costello said that:

... morale picked up and the workforce was happier ... [W]hen stakeholders are actually allowed to do their jobs, you get great results. And the notion of Canberra and, in particular, the DMO organisation, controlling activities and its contractors stops those contractors from being innovative and from thinking of

new and better ways. You can't have a central agency have a policy for innovation. Innovation comes from having competent, qualified people, given the authority to produce results [and with] the power to come to you with the ideas.

Once ASC had begun to reinvent itself, it had to sell its new practices to the DMO and the rest of the enterprise. Coles had counselled a gradual transition from the three-year to two-year FCDs, but a newly confident ASC thought that it could do better than that. In his new job as GM Submarines, David Gould had a decision to make:

Coles had set a target and he said to go there incrementally. And I sat down with Steve Ludlam and the Navy, and we thought about it. And Ludlam's view was very much 'I haven't got the time or the resources to do three different plans, so let's go straight to two years.' I discussed that with John Coles and he said 'No, that's OK. I thought it easier to go there gradually but if you think it's useful, go there in one go.' And I thought that, even if you planned on two years and you missed it by a month or two, it wouldn't be a catastrophe. I wasn't nervous—I thought it was the right thing to do.

The revised 'one-step' plan necessitated the refit of HMAS *Collins* being deferred, and systems from that boat being used as donor parts for HMAS *Farncomb*, with replacement parts to be acquired later as part of a build-up of supply-chain stock. That idea was the brainchild of ASC's then program manager for the *Collins* class, Jim Burnside. The company had been struggling with juggling the various imperfect options until Burnside had what Stuart Whiley describes as an 'epiphany'. That approach had the additional benefit of levelling out the workload at ASC, which avoided the need to ramp up manpower in the short term only to disband some of it once a steady state was achieved.¹⁸

Leaving HMAS *Collins* behind wasn't ideal—Gould didn't like the optics of the eponymous first of class being left behind—but, bolstered by his new confidence in ASC's engineering know-how, he approved the ASC plan. He thinks that he pushed his authority as GM Submarines—still a relatively new position—to the limit, but he took the advice of a senior naval officer to 'Assume you have authority, and someone will tell you soon enough if you haven't.'

The new approach required an injection of funds into ASC's facilities from the Department of Finance to build special facilities for propulsion-motor and diesel-engine overhauls and testing. As well, some practices were imported to Adelaide from the ASC Western Australian facility—the workforce there had picked up some useful knowledge from the resources-sector-centred heavy industry sharing the location at Henderson. Because of Bob Platfoot's engineering analysis of ASC's FCD work, the review team knew that the workforce resources could do it, and Finance was persuaded to fund the upgrade.

The approach paid dividends. In a sign of improving performance of the sustainment activities at ASC, HMAS *Farncomb* entered FCD in 2014 and was returned to the Navy in 2016, on track with the shorter time lines that the review anticipated, but a year and a half earlier.

From project of concern to exemplar

Rather than just presenting data from the time, it makes most sense to review the overall progress of the Coles reforms to the present day, to the extent that publicly available information allows.

Availability exceeds benchmark

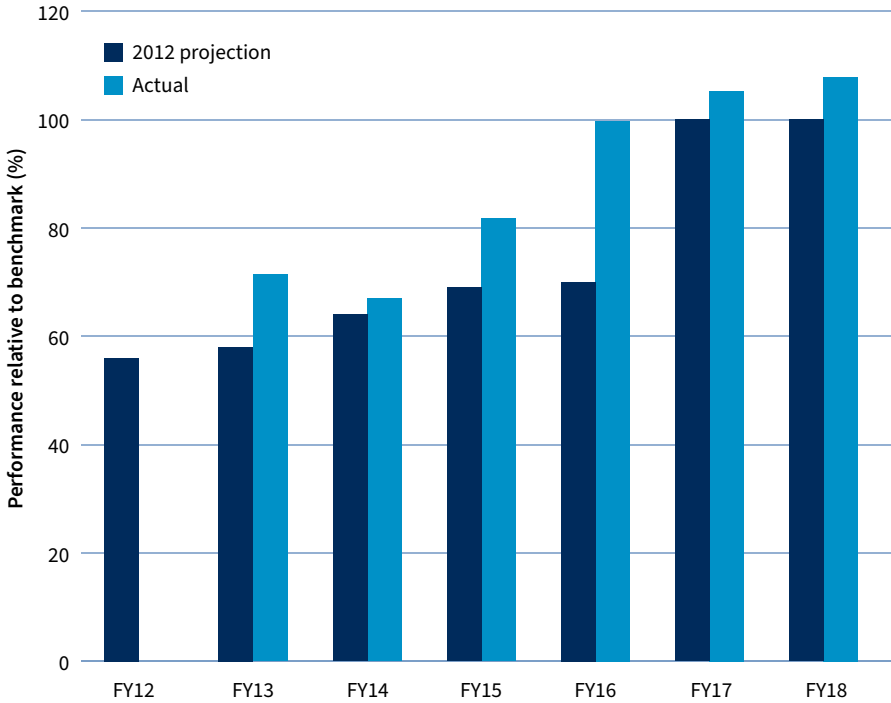
Citing national-security concerns, the Department of Defence no longer provides data on submarine availability, instead providing only a single collective number for submarine and surface-combatant MRDs in its annual report. Nonetheless, there's enough data to allow us to see the dramatically improved outcomes from the reformed submarine enterprise over the critical 2013–2018 period.¹⁹

As shown in the previous section, the review was cautious about promising quick fixes, but the recovery was in fact faster than expected: data for every year from 2013 to 2018 shows a stronger outcome than was expected. The projected sudden increase at the end of 2016 seems to have arrived as expected; the benchmark was met in the 2016–17 financial year and then exceeded in the following two years (Figure 6).

The improvement in maintenance performance in the ASC yards was similarly remarkable, no doubt contributing to that successful outcome. ASC managed to achieve the two-year FCD for HMAS *Farncomb*, which began in 2014, in 765,828 worker hours, in contrast to the more than 1 million hours required for the protracted FCD of HMAS *Rankin* that began in 2010.

As an anecdotal observation: a colleague and I visited the ASC submarine sustainment facility at Osborne around 2010, and we were underwhelmed by what we saw. A facility that was supporting a multibillion-dollar national capability had no real sense of urgency or organisation about it. A few people were working here and there on the two boats in the shed, but most of the submarine we walked through was devoid of any activity. Overall, the workshop struck us as resembling nothing so much as a much larger version of a suburban car-repair shop. When I visited again in 2015 when participating in the Defence Minister's advisory panel for the then forthcoming *2016 Defence White Paper*, the contrast was stark. The new tower arrangement was in place, and work was proceeding at multiple sites with noticeable energy. The overall impression was that the ASC yard was now fit for purpose. That change in engagement was also obvious in the briefings delivered by ASC management during both visits. Cultural and organisational changes can be very noticeable.

Figure 6: The predicted and actual availability of Collins class submarines relative to the international benchmark, 2012–2019



One explanation for the dramatic improvement might be that the Coles team had deliberately erred on the lower side with their projections, being wary of the potential negative impact on morale across the enterprise of failure to achieve the planned milestones. Underpromising and overdelivering can be a sound customer-management approach for a consultant, but that doesn't appear to have been the case here. It was becoming obvious that the pent-up drive within the submarine enterprise, which had been stifled by the dysfunctional organisation that preceded Coles, was now being effectively tapped.

Writing in the first quarter of 2016 in the final Phase 5 report of the review, Coles observed that there were:

... few, including myself, who would have confidently predicted in 2012 that the performance now delivered by the Collins class would graduate from mediocre to excellent in less than four years at almost level funding ... A program once that was considered a 'Project of Concern' should perhaps now be treated as an 'Exemplar Project', if such a category existed. [emphasis added]

Coles wasn't alone in being surprised at how successful and how swift the recovery had been. Chief of Navy Ray Griggs—who of course was the primary beneficiary of the reforms as the monopsony customer for sea days—was both surprised and delighted by the rapid recovery. While he was no longer in the job when the international benchmark was achieved in 2016, he recalls the enthusiasm with which he greeted the recovering capability in the early stages. He described the provenance of the 2013 photograph that graces the cover of this volume:

I was surprised by how quickly things turned around, and how relatively quickly we achieved benchmark. I think most people, if they're honest, would have to say that they were surprised that we not only got there so quickly, but have managed to sustain it—it's now 10 years since the review.

I remember the day that we got three submarines. That was during my last six months of my time as [Chief of Navy], I think. You've seen the photo coming down Cockburn Sound with three boats. I remember detailing the CO of [Fleet Base West] HMAS Stirling. I said ... this is a strategically important photograph because it sends a very powerful message that what we've been doing in the last couple years has actually made a difference. It has translated into three boats in the water running at the same time.

Griggs wasn't the only important player who had moved on before the benchmark was achieved, but even the earliest results were both heartening and useful to the Defence Minister. Steven Smith was more relieved than surprised by the turnaround but was also pleased that the recovery started almost immediately. In the conversation about the future submarine project at the Expenditure Review Committee and National Security Committee, he explained that the knowledge obtained from the Coles review wasn't just applicable to the Collins class but could also inform planning for the follow-on class. Because of that, the argument went, the errors in planning for the Collins class wouldn't be repeated. Up to that point, he'd been unable to gain much traction for SEA 1000, partly due to the optics of the underperformance of the Collins fleet, and partly because there was little solid information on which to base future planning. He recalls that the cabinet discussions about the future submarine were:

... a much better process as a consequence of being much more clear-sighted about Collins—its capability, its performance, how we've managed it and what we need to do for maintenance and sustainment in the future submarine.

Did increased funding make the difference?

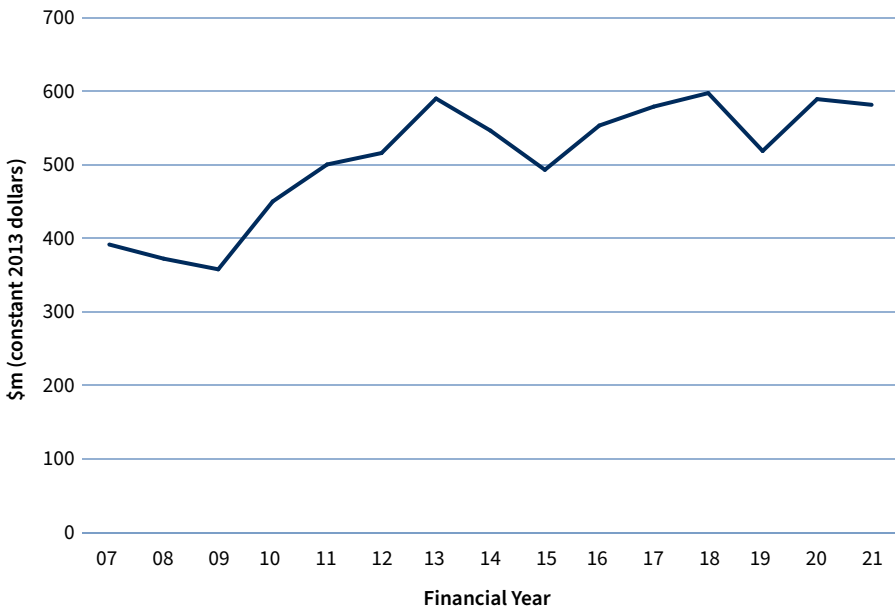
To properly evaluate the reforms in terms of cost-effectiveness, it's necessary to look not just at the availability outcomes but also at the costs of obtaining them. The DMO still had concerns about the cost of sustainment and worried that the improvement

had been driven in large part by budget increases. That view is consistent with a comment to me by Stephen Gumley that he wasn't surprised by the turnaround, ascribing it to the availability of additional money.

Squaring that line of thought with Coles's comment about 'nearly level' funding requires an analysis of Defence annual reporting data—the most reliable time-series of sustainment costs that we have in the public domain—to see which perspective is more accurate.²⁰ A detailed analysis shows that both parties have a point: additional funding was required up front, but in the longer term the sustainment budget has been flat.

Figure 7 shows the Collins-class sustainment budget before and after the Coles reforms. Expressed in same-year 2013 dollars (chosen as the first year of the transformation process), the 2013 budget was fully 50% higher than the 2007 budget, and 20% higher (approximately \$100 million) than the budgets in 2010 and 2011 (the two years immediately preceding the transformation). That quantum is consistent with the short-term injection of funds detailed in the implementation strategy. In the following years, the budget actually decreased for FY 2014 and FY 2015, consistent with the transformation costs being heavily front-loaded.

Figure 7: Inflation-adjusted Collins-class sustainment budget, 2007 to 2021, expressed in constant 2013 dollars



Source: ASPI analysis of Defence annual reporting data.

As previously noted, I've long been of the view that the submarine sustainment effort was seriously underfunded in the first decade of the fleet's existence and that the rundown in availability wasn't surprising, given that shortfall. The ASPI analysis of sustainment costs of 2007 showing that the Collins fleet was receiving approximately the same funding per hull as the Anzac frigates of similar unit tonnage pointed to a problem. That practice wasn't consistent with requirements of the additional complexity of submarine maintenance versus that of surface vessels. Data from other countries suggests that submarines cost about 50% more than comparably sized surface vessels, so the ramp-up to \$500 million in 2011 actually reflected a more realistic budget for the fleet. That's also consistent with industry benchmarks. Bob Platfoot told the review team that the globally accepted benchmark for maintenance funding for heavy industrial plant was a certain percentage of replacement asset value spent per year. The percentage varies according to the equipment type and the nature of its operational environment, but a figure of 7% was about right for submarines. For the Collins fleet, with an acquisition cost of \$6 billion in the late 1990s, that translates to approximately \$600 million per annum by 2012 after allowing for inflation.

In any case, that pre-2012 funding isn't due to the later Coles reforms, instead possibly reflecting the DMO's own efforts to remediate the situation—we saw earlier that additional funding tranches were sometimes sought to address shortfalls. After the Coles transformation began, the real budget has remained in the range \$500–600 million over the entire period to 2021, albeit with an additional investment into ASC from Finance that isn't captured in the Defence reporting. But Coles's observation that the improvements had been achieved on nearly flat funding is well borne out by the data, while ascribing the success to a recurring funding boost isn't correct. A possible source of confusion on this issue is the increase in operating costs—as opposed to sustainment costs—as availability improved. Crew numbers increased (slowly), and the consumption of fuel and other supplies during training and operational activities would have increased the total cost of ownership of the submarines as more MRDs became available, but it wouldn't be right to ascribe those additional costs to the Coles reforms.

Was the Coles review required?

Not surprisingly, the resounding success of the remediation program resulted in something of a scramble for credit. The various parties justifiably point proudly to the contribution they made in making the transformation program such a success. Sometimes the claims are overlapping, such as with the development of the 10 + 2 UUC construct. That very successful solution had its genesis in the approach adopted in the UK. Australia was fortunate to have several key players with intimate knowledge of the processes that the UK MoD and industry base had implemented.

There, the operating periods of both surface vessels and submarines had been safely extended, with a resultant large boost in availability for the Royal Navy.

Steven Ludlam recalls holding internal discussions—including some before the Coles review—in which he discussed similar solutions with the ASC engineering staff, drawing on his UK experience in improving submarine availability. Coles similarly recalls it being a solution consistent with his experience while working for the UK MoD. But, while the development of the 10 + 2 arrangement was inspired by the British experience, it's uniquely Australian, being developed in its final form by Arthur Fisher for the fleet of six boats. As with several of the threads in this story, it seems that collective thinking converged to produce a good outcome, for which the review provided the catalyst.

There was one slightly discordant perspective that came up a number of times during the research for this volume. Most of the contributors agreed that the Coles review was a critical circuit-breaker, without which poor outcomes would probably have continued, but some of the DMO principals whom I consulted have a slightly different take. All acknowledge the quality of the Coles team's work and accept that it helped to grease the wheels with government, but they're also at pains to point out that the DMO had already made efforts to start the remediation process. We've already seen that the DMO's Warren King was underwhelmed by the value of some of the Phase 2 work. Like Chris Deeble, he thought that some of the key steps had already been taken. Noting Coles's surprise at the rapidity of the recovery, Deeble said that, in his view, it was:

... the work we [the DMO] started earlier that started to create the momentum. There is no doubt in my mind that the Coles report had some really good stuff in it, but it wasn't the starting position. We'd already started the journey before ... Coles actually did his report.

That's probably true to an extent. Prior to the start of the Coles review, nobody was under any illusions about the then current condition of the enterprise, and good-faith efforts were underway to attempt reforms, with some encouraging initial results.

The public Phase 3 report recognises the efforts that were already underway and offers its own assessment under the heading 'Will current improvement initiatives address these issues?'. It agrees that the DMO had successfully identified some of the issues, and the study included a detailed look at how the existing initiatives affected various points on the value chain, as well as assessing their current status, but it ultimately concludes that Defence's internal reform process was more about 'tactical' logistics and supply-chain issues and less about the big-picture 'strategic' failures that had led to the poor outcomes:

The current initiatives underway in the RAN, DMO, and ASC align with the majority of our findings. Many of the current initiatives are aimed at addressing the fundamental sustainment management issues of maintenance obsolescence and reliability management, supply chain improvements, establishing adequate crewing and introducing performance-based management. However, they will not resolve all of the issues or root causes identified in this report.

In the main the existing initiatives are aimed predominantly at resolving specific sustainment issues. There are some key issues that are not being addressed at all, mainly at a strategic level across the Collins Class Sustainment Program, while other issues are being addressed by multiple initiatives. These overlaps and gaps will require coordination and realignment of their ownership. Where key issues are not fully addressed the current initiatives will require enhancement.

In assessing the relative importance of the pre- and post-Coles reforms, it's hard to look past the results of the Phase 2 cultural survey. While there was a strong commitment to achieving high levels of effectiveness, the survey revealed that a substantial fraction of the enterprise workforce felt under-resourced and lacked confidence in the overall leadership and direction. Perhaps the most striking result of the survey is that there was a lack of a performance-based ethos in *all* of the organisations surveyed. Despite there still being an overall sense of the importance of the capability, it seemed that many people involved with the submarines had largely given up on trying to improve the outcome, having become disillusioned after multiple false starts in the past.

At the time of the review, it had become central to the narrative within DMO that the major problem was the lack of an outcome focus at ASC, along with a perception that the contractor had become content with continuing to be paid while underperforming. (I heard that many times from DMO seniors in the period from 2008 to 2012.) The underperformance at ASC was certainly not a fiction—multiple 3,000-tonne submarines up on blocks out of the water are pretty solid evidence—but we've seen that ASC itself was far from content with the situation. It was frequently stymied by the lack of clear vision and direction and by the difficulty of obtaining the spare parts and resources required to perform its core function. And it wasn't alone in having an insufficient focus on the outcomes.

The survey showed that it was in fact the DMO that had the biggest self-assessed lack of a performance ethos, with scores below the enterprise average in every relevant category. As well, the survey found that a disconcerting fraction of the DMO workforce lacked an understanding of the organisation's role as a provider of services to the RAN. When considered with the wider study findings about the bottlenecks and shortages in spares and logistics shortfalls, it seems that DMO staff had little understanding of or empathy for the position that ASC was in.

The Coles team picked up a general feeling that the relationship between the DMO and ASC was ‘poisonous’—the term was used unprompted by several interviewees. That was largely corroborated by the survey results. Coles recalls that, among the very few changes requested when the report was being finalised, the language about that was toned down at the request of then Defence Minister David Johnston²¹ to make it easier to work through the system. Despite the considerable management skill and goodwill exhibited by Chris Deeble as the lead for the DMO, internally generated reforms were going to find it very tough going in that environment. They might have pointed the enterprise in the right general direction, but the sights were probably set too low. And it’s hard for any organisation to do the introspective soul searching that the DMO needed to do at the time.

Ultimately, the impetus for change seems to mostly have been generated by the Coles review. In my view, it’s hard to imagine that the submarine availability could have met the international benchmark in 2016 without the review—and it might never have done so.

But it would be too narrow a reading of the situation to suggest that the DMO was the impediment to success and a newly liberated ASC the reason for the turnaround. In fact, a careful analysis of the situation faced by those organisations leads us to the issues at the heart of the Coles findings. The first two review phases clearly showed that the failure was systemic across the enterprise. And there was probably something of a negative feedback loop that led to the situation in which the DMO and ASC were simultaneously frustrated in their ability to achieve the outcomes they both sought.

When the availability first began to fall off, it isn’t surprising that the DMO’s response was to try to manage the situation more closely. Organisations (and individuals) respond to the incentives and disincentives that they’re presented with. Given the political environment in Canberra, the DMO had a powerful disincentive for resisting the urge to be interventionist. Collins-class sustainment was but one of a series of project missteps, as evidenced by the long Projects of Concern list at the time. The negative publicity associated with that, along with long and frequently uncomfortable sessions for DMO executives being grilled by parliamentary committees, created an environment in which being seen to take more control in order to resolve the issue allowed for at least short-term reprieves. When the result of that was further deterioration in performance, the feedback loop worked to further worsen the situation.

It would take a brave contract manager to step back and trust an underperforming contractor to correct the situation. By dint of its role, the DMO was obligated to stay involved, and to be seen to be involved. The initiatives launched by Gumley (and later King) and Deeble were an attempt to manage a way out of unhappy circumstances,

consistent with the constraints imposed by the Canberra ecosystem. Coles wasn't so constrained and could cut through the problems more effectively than the DMO could on its own, and more or less force the various parties to trust the others. We'll never know how effective the DMO initiatives would have been without the external review, but they would probably have taken longer to have a positive effect. Trust can spiral downwards quickly, but it takes a long time to build back.

Illustrating some of the above points, Warren King was happy to give ASC credit for its initiatives but also pointed to some of the pressures that the DMO (and the Department of Finance as owners of ASC) were under, saying that the sustainment performance improved:

... once [ASC] gripped it up. But the thing about that is it wasn't hard for them, because they didn't have to deal about the money side. I had two outcomes. One was the technical outcome, but I still felt that we were paying too much against the international benchmark for an operating hour. But when it came down to it, the resolution was to get on top of the operational availability first ... and then deal with the cost aspects later. In the national interest, getting an operational capability is your number one priority.

King might be right about the cost relative to the international benchmark, as even the flat funding curve of Figure 7 could be higher than the spending of the comparator countries, although variations in accounting practices make that hard to assess. However, a 2013 RAND Corporation study into Australia's naval shipbuilding sector found that Australia paid a significant premium for local shipbuilding, so a similar result for ship and submarine sustainment wouldn't be surprising. Unfortunately, there's no reliable public data to allow a firm conclusion to be drawn on that point.

In his role as GM Submarines, David Gould had perhaps the closest view of anyone of the Coles reforms. He's adamant that 'without Coles and the creation of GM Subs (not necessarily me) the project stood no chance of the success it achieved.'

Chapter 6: Sustaining and building on success (phases 4 and 5)

After the transformation process, Coles and his team performed two reviews of progress towards the benchmarks. The first was the result of a Phase 4 review and was published as *Progress review—March 2014*. It showed that things were well underway, as reflected by the data and discussion in the previous chapter. The fifth and final phase of the review was the basis for the sixth major report (and fourth public document), *Beyond benchmark*, published in May 2016. The aims were to summarise the progress that had already been made, assess the robustness of plans for sustaining the Collins-class boats until their retirement, and look at ways to achieve still higher rates of availability, lower sustainment costs, or both.

The assessment of progress extended only to early 2016, but the data then available showed significantly improved performance, and that the positive steps recognised in the 2014 assessment had proven to be indicators of further progress ahead. By 2016, the team was also of the view that the arrangements in place had a degree of robustness to them that would allow the system to deal with the sort of mishaps and unexpected events that are relatively common when operating submarines, writing that:

... there is now considerable resilience to deal with an unplanned major repair to one of the submarines of up to four months or so per year without a major disruption to the operational program.

At the time of writing of that report, the level of unexpected defects was low, and maintenance was running pretty much to schedule for the first time. HMAS *Farncomb* had just been released to the Navy after the first two-year refit cycle of the 10 + 2 arrangement, and there was more optimism about the capability than had been the case for many years. The improvement in maintenance-schedule adherence was striking. The Phase 2 assessment (Figure 2 in this volume) showed that overruns were fully 2.3 times the international benchmark. The corresponding figure in the Phase 5 report, three and a half years later, was 0.42 (that is, less than half of the benchmark). The rate of unexpected defects showed a similarly impressive reduction.

There was a temptation in some quarters to ‘cash in’ the low defect rate and maintenance efficiency by pushing for even more availability. That was especially true of the new government, which was delighted to have inherited a submarine capability that had turned the corner.²² Discussions began about the possibility of further consolidating the improvement by doing even better than the benchmarks, getting as much availability as possible out of the fleet. While that might seem

a reasonable proposition, trying to maximise availability potentially risked the sustainability of the solution by driving the system too hard. Coles and his team preferred to regard the still untapped potential ‘as a regulating buffer to be used to best advantage by the submarine enterprise’.

It wasn’t his decision to make, but Coles understood that striving to maximise availability was missing the crucial point of having the number of MRDs set by mission and training requirements. If those requirements were able to be satisfied, then additional sea days were of little value. He advised against it:

I didn’t see much point getting greater availability just for the sake of it. When we looked in detail at what was proposed, it wasn’t very useful additional availability for the patrol cycle Australia runs on and trains for. My recommendation [to Minister Johnston] was that you shouldn’t ... and it won’t give you extra resilience if you do.

Judging by the availability data for the 2014–2020 period, that advice seems to have been accepted by the minister: no surge in availability (or expenditure) is visible in the data.

Finding savings

Phase 5 also turned its attention to the potential for cost reductions, which hadn’t been the primary focus of previous phases. The report notes that ‘... there should now be a greater focus on cost reductions through new efficiency measures. Previous reports recommended that a “bye” be granted against cost reduction until benchmark performance was attained.’ It was thought that savings could be reinvested in dealing with obsolescence issues as they arose, deepening inventories, building new infrastructure and for the transition to the future submarines to be acquired under SEA 1000. But savings are always desirable, and submarines aren’t the only defence capability to be managed. A reduction in ownership costs anywhere in the portfolio potentially allows for greater capability elsewhere.

Trying for even higher levels of availability would probably have put any potential savings at risk. Attempting to get the last few percentage points of performance from any system is a significant cost driver, due to the law of diminishing returns. A well-known aphorism in defence acquisition is that ‘The last 10% of performance generates one-third of the cost and two-thirds of the problems.’²³

The dangers of success

However, even if there was no push for additional availability, and the international benchmark output was to be accepted as the steady-state solution, there were risks to manage. One of the dangers of success that came faster and more completely

than even the principals in the study thought likely was that, over time, complacency might set in across the enterprise. ASC's Stuart Whiley was aware of that risk when asked about the long-term prospects in 2021:

I think we have to make it endure—it's an imperative. My worry is that we have become victims of our own success. People think it's easy, and it's not easy. It's difficult. And it requires constant vigilance, constant focus, and constant attention. And we are doing really well at the moment. And I don't want to become a victim of our success.

The enterprise solution that was put in place as a result of the Coles review certainly settled down to a high level of performance in a short time. And, in many ways, having a process that's ticking along so efficiently that it seems the natural state of affairs is a nice problem to have, but Whiley is right to suggest that vigilance is required. That will be especially true over time as people who were around in the bad times and for the transformation process move on to other jobs and other organisations. There's a lot of corporate knowledge that underpins the arrangements and processes that were put in place in the Coles transformation.

While the risk of losing corporate memory over time is present in every organisation within the enterprise, it's probably highest within Defence, especially given the common practice of moving senior military officers between positions every couple of years. To its credit, the Navy recognised the potential problems that could create and has done a creditable job of maintaining continuity of personnel in the area of submarines over much of the decade following Coles (and Defence has also been much better at keeping uniformed experience within other specialised areas, such as capability development). However, eventually people will move on, and hard-won lessons of the past will tend to fade from memory. It's to be hoped that the thorough documentation of the Coles review process will serve as a resource for future incumbents of key roles in the submarine enterprise.

Warren King made a good point in sounding a more general note of caution. While noting that the result in the Coles case was a good one, he was worried that the positive outcomes would be attributed to circumstances specific to submarine sustainment. Talking about the Coles review in the context of other procurement and sustainment processes, he worried that:

... the lessons learned are never implemented properly. That's because the lesson learned is to avoid getting into the situation by proper planning and decision-making early. [We had] an independent review we all lived by and were all committed to, and we solved it. But the real lesson to be learned is how to avoid it.

Chapter 7: Conclusions

When reduced to its essentials, there's no great mystery about why the Coles review and the remediation process that followed were successes. At its heart, the review work boiled down to carefully working out who added the most value at every step of a complicated process and then ensuring that they had resources and delegated authorities to execute the task. However, it sometimes takes a new and impartial set of eyes to make the observations necessary to do that. Organisations can become entrenched in behaviours and processes that have evolved through a series of historical accidents that are then bedded down, with the various working areas devolving into fiefdoms that jealously guard their own resources. The end result is often high levels of inefficiency and rancour. The poor outcomes that result then lead to even more dysfunction as the various parties try to distance themselves from responsibility for them. That was the situation that Coles and his team encountered when they embarked on the project.

The Roman historian and politician Tacitus wrote that 'Victory is claimed by all, failure to one alone', so John Coles knew what he was doing when he insisted that nobody would win unless everyone won. In that, he succeeded admirably—one of the striking aspects of researching this volume was the enthusiasm that all of the participants had for discussing the process. It was common to refer to the review and its successful implementation as a career highlight. Everyone was proud to have been involved in what they rightly viewed as a highly successful effort to redress a failing in the management of an important national capability. Given the starting points of very poor submarine availability and acrimonious working relations wherever Coles looked, the recovery of the capability to a point that surpasses the international benchmark is remarkable. The unanimous and remarkably harmonious view of what was achieved is a tribute to the skill that the review team brought to the people-management side of its task. While some technical input was needed to get a good result, it wouldn't have been enough without an appreciation of the human and organisational dynamics.

When everyone pulled in the same direction, the results were swift and dramatic. At the most senior level, the Finance and Defence ministers were in lockstep and were focused on finding a solution, and such high-level buy-in greatly helped to facilitate the finding of a solution. The DMO deserves credit for initially calling for a review, drafting helpful and sufficiently expansive terms of reference, and then for later prioritising the implementation of the review findings. The reforms to Defence's own structures that saw the DMO become the Capability Acquisition and Sustainment Group, including the instigation of the role of capability managers, were consonant with the Coles aim of having top-level requirements drive support arrangements.

Under those effective revised organisational structures, the leadership of David Gould as the first GM Submarines and Ray Griggs as Chief of Navy and submarine capability manager effectively drove the transformation program to a successful outcome. On the industrial side, ASC took a bold step in moving to the two-year FCD, and then delivered on it at the first attempt.

The main lessons that can be drawn from the success of the Coles review are as follows.

1. When developing a capability that depends on a large number of components working together, having a clear qualitative and quantitative view of the end state to be achieved is crucial, and it must be driven by the customer. In this case, the Navy had taken delivery of very fine platforms but didn't have an easily communicated criterion—the number of required MRDs to meet training and operational requirements—for the rest of the enterprise to work towards.
2. Capability and project planning can't stop when a new system reaches operating capability but must take into account the through-life management of the asset, including adequate resourcing. The Collins-class support arrangements fell over in no small part because they were poorly planned in the first place and received insufficient funding. The first few years after delivery went deceptively well in terms of days at sea largely because the build program had delivered a high-quality product that took time to degrade, but degradation was inevitable, given the inadequate planning and resourcing.
3. Getting a solid understanding of the perspectives, interests and incentives of stakeholder groups is a critical step in grappling with complex organisational arrangements. Aligning the incentives of the parties so that 'everybody wins' goes a long way towards ensuring success.
4. In a fractious environment, hard data and a solid evidentiary basis for findings help to break down institutional resistance and to provide enough confidence to undertake complex and expensive projects that don't pay off for some years.

Afterword

Many of the current capability-management arrangements in Defence, especially the top-down approach of having the capability manager set the performance targets, make it harder for a pre-Coles situation to redevelop. Therefore, it's to be hoped that there's no need for an exercise of this type to be repeated, either with the Collins-class boats in their remaining 10–15 years of service or with its successor class after delivery.

However, an exercise like the Coles review shouldn't be regarded as something that was only required once due to exceptional circumstances and that will never be required again once the problem is fixed. It's unfortunately possible for a mixture of complacency and the loss of corporate knowledge over time to set in, and for very hard-won lessons to be gradually forgotten. A significant rundown of an important defence capability has consequences that extend beyond the immediate impact on the ADF's ability to meet tasking requirements in a contingency. It can take many years to make up training shortfalls and to rebuild workforce experience. The near collapse of submarine availability pre-Coles also affected planning for the Collins-class successor under project SEA 1000. Looking back, the delay of five years or so reduced the time for careful planning of the management of the remaining Collins life of type and the transition to the follow-on class. Every federal government since 2007 has been faced with difficult decisions about the future of the submarine fleet. Today, after an expensive false start with the French designed Attack class, we face a longer wait for a Collins life-of-type extension (LOTE) program and eventual replacement than would have been the case had things run more smoothly after the delivery of the final Collins-class boat in 2003.

The Department of Defence has a mixed record in maintaining corporate knowledge and building on past achievements in its complex activities, and it's by no means guaranteed that future incumbents in the critical roles identified by the Coles study will have a sufficient appreciation of the tasks that they're faced with, or even where the potential fault lines are.

That said, there's room for cautious optimism because there are precedents for the enduring remediation of systemic problems within Defence. For example, after a series of disastrous accidents and capability shortfalls in the 1990s, the RAAF recognised that it needed to adopt a rigorous focus on airworthiness and to modify its support arrangements to provide the required number of flight hours safely and efficiently. Despite the introduction to service of many new high-performance and extremely complex aircraft types since then, aircraft fleet availability has remained high and accidents are rare—to the point where the current senior leadership of the

service has never had to confront the results of a fatal accident. The RAAF is rightly proud of its recent record and instils the importance of a focus on airworthiness in all of its officers.

Submarines are similarly unforgiving platforms that require focused and careful management to ensure operational effectiveness with high levels of safety. At the time of writing, there are signs that the Coles reforms to the Collins-class support arrangements are under stress. The picture from the implementation of the Coles review through to 2021 was generally one of good levels of availability, and the support arrangements were flexible and robust enough to handle the inevitable occasional setback, such as a fire on HMAS *Waller* in April of that year.

Given the lack of up-to-date, publicly available data, it's hard to be sure about the current status of the Collins fleet, but enough is known to sound a note of caution. In May 2023, the ABC TV program *Four Corners* reported a shortfall against operational targets over the previous two years.²⁴ That seems to have been due to a combination of factors, including the impact of the Covid-19 pandemic on supply chains, a flooding incident on HMAS *Sheean* while HMAS *Waller* was still under repairs and a continuing issue with generating suitably experienced crews—especially in command positions. The RAN has admitted to a shortfall against its benchmarks over that period, but has downplayed the problems, pointing to an outcome of '86% capacity' (presumably against the Coles benchmark) despite the stringencies of the times and projecting a normalisation of outputs in the year to come. That might well prove to be the case—it's certainly to be hoped so—but, as we've seen, the smooth sequencing of maintenance activity within the 10 + 2 duty cycle was an important ingredient of the Coles remedy, and problems can compound if there are peaks and troughs in the workflow.

Things are certainly not going to get any easier for the managers of Australia's submarine capability. The cancellation of the contract for the follow-on Attack class conventional submarines and the announcement of a move to nuclear-powered submarines under the AUKUS banner mean that the Collins fleet will now be replaced later than was planned at the time of the Coles review, and by boats of a very different nature that require a range of skills not currently resident in the Australian submarine enterprise. As well, the Virginia-class nuclear submarines that will be the first to be delivered to Australia under AUKUS have almost twice the crew size of the Collins.

The Collins-class LOTE will provide the fleet with a technology refresh and a systems update to keep it viable well into the 2030s. However, to keep the boats at sea with high availability, which will be even more critical as crew numbers are built up for the nuclear-powered submarines, that work needs to be done within the standard 10 + 2 cycle, rather than adding additional downtime. That will be extremely challenging,

and rigorous planning needs to ‘bake in’ the right sequencing, always with the annual number of sea days as the end goal. A significant shortfall of availability during the run-up to the most complex transition the RAN has ever managed would almost certainly prove disastrous. Given the positive results of the Collins-class remediation when all of the relevant parties worked in synch, that doesn’t seem impossible to achieve. Done properly, a successful LOTE should make the boats more supportable by replacing obsolescent subsystems. But, in any case, the senior managers trying to simultaneously grapple with the Collins-class LOTE and the transition of the submarine enterprise to be able to eventually crew, operate and support nuclear-powered submarines would benefit from a careful study of the work described in this volume.

Appendix 1: Time line of the Coles review and reporting

In total, there were five phases of work, reported in six major documents. Four of those were made publicly available shortly after delivery to the principals.

Phase 1. A scoping exercise based almost exclusively on oral evidence, from which the Coles review team based its initial findings. It formally commenced in June 2011, reported to the principals in November and published the *Collins Class Sustainment Review Phase 1 report* in December 2011.

Phase 2. A data-collection and analysis exercise that commenced in March 2012 and formally reported in the classified *Collins class sustainment study* in June 2012. This report was a compendium of compelling evidence of the serious shortcomings in the sustainment enterprise, along with supporting recommendations.

Phase 3. A continuation of the work of Phase 2, including the development of an implementation strategy. The work was conducted in the second half of 2012. Two reports were issued for this phase. The first Phase 3 report, *Study into the business of sustaining Australia's strategic Collins Class submarine capability*, was essentially a declassified version of the Phase 2 report, without the sensitive annexes. It was published in November 2012 and is available online.²⁵ The other report, which wasn't a public document, was titled *Study into the business of sustaining Australia's strategic Collins class submarine capability implementation strategy*. It was also issued in November 2012.

Phase 4. A check on the 'performance achieved by March 2014 by the enterprise, and an evidence-based assessment of the progress towards the benchmark in FY17'. The report, *Progress review—March 2014*, was released publicly and is available via ASPI.²⁶

Phase 5. A final review phase, with three main focuses: measuring the level of performance at the time, assessing the Australian Government's plans for sustaining the capability to deliver the required outputs until the submarines are withdrawn from service, and reviewing to attain even better performance and/or reducing annual sustainment costs. The *Beyond benchmark* report was published in May 2016.

Appendix 2: The Coles review's terms of reference

STUDY INTO THE BUSINESS OF SUSTAINING

AUSTRALIA'S STRATEGIC COLLINS CLASS SUBMARINE CAPABILITY

TERMS OF REFERENCE

1. AUTHORISATION

- 1.1 The Secretary of Defence, Chief of the Defence Force and Secretary of Finance and Deregulation have commissioned this benchmarking study as part of the work program of the Government-ASC Steering Committee overseeing issues relating to Collins Class Submarine (CCSM) sustainment requiring whole-of-government consideration.

2. PURPOSE

- 2.1 The purpose of these Terms of Reference is to specify the scope of the benchmarking study into the optimal arrangements for CCSM sustainment.

3. CONTEXT

- 3.1 Established in 1985, ASC Pty Ltd (ASC) was chosen in 1987 to design and build the six CCSMs and contracted in 2003 to deliver submarine through life support, and in 2005 a subsidiary of ASC was awarded the shipbuilder role for the Hobart Class Air Warfare Destroyer (AWD). ASC is therefore a nationally strategic industry asset for Australia, providing critical capability in support of the Royal Australian Navy (RAN).
- 3.2 ASC, as a Government Business Enterprise (GBE), is both owned by the Australian Government, and for CCSMs, is a sole Industry Partner/Supplier to Defence in a monopsonist relationship. These circumstances are unique in comparison to Defence's other dealings with commercial entities. This uniqueness needs to be recognised and brings significant challenges.
- 3.3 ASC is a proprietary company, incorporated under the *Corporations Act 2001*, and is prescribed as a GBE under the *Commonwealth Authorities and Companies Act 1997*. Under this commercial framework ASC is required to operate and price efficiently, earn a commercial rate of return and comply with the Commonwealth's Competitive Neutrality Policy.

- 3.4 In 2003 Defence established a long term Through Life Support Agreement (TLSA) with ASC for the sustainment of the CCSM. TLSA is essentially a cost-reimbursable, limited performance-incentive contract with annual negotiation of budget and work scope. Defence engages mission system contractors separately and provides materials as Government Furnished Equipment for in-service CCSMs.
- 3.5 In 2008, in response to an indication by the then Government that ASC would be privatised, Defence sought to renegotiate the TLSA to reflect industry best practice arrangements, including recognition of the need for ASC to undertake incremental improvement and, with increasing levels of maturity, risk transfer and accountability for outcomes.
- 3.6 Since 2009 a range of Collins program reform initiatives have been ongoing including the establishment of the Australian Submarine Program Office, collaboration between the RAN, DMO and ASC, agreement on the Integrated Master Schedule (IMS) and negotiation of a performance-based In-Service Support Contract (ISSC) with ASC. A critical aspect of the ISSC is the establishment of appropriate business arrangements and performance parameters to benchmark CCSM sustainment to ensure the whole-of-government objectives are met.
- 3.7 ASC wishes to identify world best practice goals in order to establish objective benchmarks against which it can demonstrate its improvements and compliance.
- 3.8 Defence wishes to ensure that the required availability of reliable submarines is delivered to the RAN through the CCSM Integrated Master Schedule at an affordable price and represents value for money.
- 3.9 A joint aim of Defence and ASC under the ISSC is to enhance the national submarine sustainment industry through stronger engagement and utilisation of a wider industry base with a best of breed 'Make-Buy' approach which aims to provide long term efficiencies and value for money. The key principles aligned to these outcomes and arrangements are captured in an ISSC Heads of Agreement between Defence and ASC now, used to guide the detailed contract negotiations.

4. OBJECTIVES AND SCOPE

- 4.1 The broad objectives for this review are to determine:
- the optimal commercial arrangements between Defence and ASC to support the delivery of efficient and effective CCSM sustainment, which will be used to guide the ongoing development of the 'SSC commercial framework';

- the appropriate performance goals for sustainment activity, based on world best practice efficiency and effectiveness benchmarks;
 - options for demonstrating value for money in sustainment activity and the supply chain arrangements;
 - opportunities for improvements in management arrangements between ASC, DMO and the RAN to achieve an efficient submarine sustainment business;
 - future infrastructure needs to support the submarine sustainment activity;
 - measures to be implemented by DMO and the RAN to ensure that ASC is able to operate under a performance-based contract; and
 - the subsequent priorities for ASC, DMO and the RAN reform to effect greatest improvement, given time, budget and system constraints.
- 4.2 It is not intended that this review examine or make recommendations regarding ASC's overall governance framework, but rather the commercial and contractual arrangements for submarine sustainment between ASC and DMO.

5. METHOD OF CONDUCT

- 5.1 This study will be conducted in four phases:
- Phase 1 Mobilisation, scoping analysis and planning — It is proposed to engage the review team on a not to exceed time and materials contract arrangement to undertake the development of the detailed statement of work, deliverables, schedule and planning arrangements through initial consultation between the proposed review team, Defence, Finance and Deregulation and ASC. The outcome of this phase will be a detailed and structured scope of work; to be reviewed by the Government-ASC Steering Committee, with an accurate cost and schedule for its execution. This will form the basis of a contract amendment to complete the main body of the review.
 - Phase 2 Data collection, analysis, option and implementation strategy development and interim recommendations — This phase will be based upon the detailed statement of work, deliverables and schedule developed during Phase 1. A key outcome of this phase will be a framework and industry best practice benchmarks against which DMO, the RAN and ASC performance in delivering CCSM sustainment can be assessed.
 - Phase 3 Final Report and recommendations — This phase will enable the review team to take feedback and incorporate further clarification to the findings and recommendations based upon the review of the Interim Report by Defence, Finance and Deregulation and ASC.

- Phase 4 Follow Up Review, Analysis and Recommendations — This phase will enable the review team to undertake a progress review of the transition to the new ISSC and assessment of performance against the recommended framework and industry best practice benchmarks.

6. TIMING

- 6.1 The initial phase of the study will commence early in the third quarter 2011 to establish and agree the detailed scope of the tasking, establish the planning framework, team administration and support arrangements.
- 6.2 The main body of work is expected to be conducted during the third and fourth quarter of 2011 with an interim report for consideration by the Government–ASC Steering Committee to be received by December 2011 and final Report for consideration by the Government–ASC Steering Committee by March 2012.
- 6.3 A follow up review will be scheduled for the second and third quarter 2012 to coincide with preparations to transition the ISSC into a more mature and robust performance based arrangement.

7. SPECIFIC DELIVERABLES

- 7.1 The deliverables from Phase 1 of the review will be a detailed statement of work, outline of proposed deliverables, review schedule, administrative framework and a supporting cost estimate for the conduct of Phase 2, 3 and 4.
- 7.2 Other deliverables will be specified as a result of the contract amendment to incorporate the outcomes from Phase 1 of the review.

Notes

- 1 Since many of the interviewees for this volume speak of ‘the DMO’ in quoted remarks, the historical name is used throughout, rather than ‘Naval Shipbuilding and Sustainment Group’, as it is today.
- 2 Materiel ready days, as the name implies, are days on which a submarine is available for tasking by the Chief of Navy.
- 3 Greenfield had been a member of the 1999 independent assessment of the Collins-class submarine project commissioned by the then Defence Minister.
- 4 Sammut went on to play important roles in submarine capability development within Defence. He was the head of the Future Submarine Program from 2013 to 2020 and was in the civilian position of General Manager Submarines, a position instigated as a result of the Coles review, from 2020 to 2022.
- 5 That’s in contradistinction to the situation with the Oberon-class submarines, which were a modified version of a submarine designed and built in the UK to Royal Navy specifications.
- 6 In fact, there was an option for two additional boats in the original project plan. The option wasn’t taken up when delays and problems emerged in the initial build work.
- 7 During an FCD, the submarine is stripped, its hull is cut open, and its diesel engines and main motor are removed. Significant upgrades may occur, including combat system enhancements and modifications. (Source: ASC.)
- 8 The use of the word ‘enterprise’ in this context is a point of pride among those involved, reflecting as it does a unified approach across several organisations that wasn’t taken prior to the reform process. Its original application is claimed by several of the parties consulted for this work, although Coles has a very strong claim, having used the term in his earlier work in the UK developing the Submarine Enterprise Collaborative Agreement. The term was first used publicly in Australia in the review’s Phase 1 report. It’s used in this volume as a shorthand term for the collective parties.
- 9 ‘The idea of the value chain is based on the process view of organisations ... seeing a manufacturing (or service) organisation as a system, made up of subsystems each with inputs, transformation processes and outputs. Inputs, transformation processes, and outputs involve the acquisition and consumption of resources—money, labour, materials, equipment, buildings, land, administration and management. ‘Porter’s value chain’, Institute for Manufacturing, University of Cambridge, 2024, [online](#).
- 10 ‘Man-mark’ is a British sporting term that means ‘to stay close to a specific opponent to hamper his or her play’ (Collins Dictionary).
- 11 More so than most defence platforms, submarines are very delicately balanced machines, and changes of mass or volume in one system can have flow-on effects throughout the boat. The original designers produced a holistic arrangement of systems with overall balance in mind, and that design intent is an important consideration in configuration management.
- 12 In defence economics, even very high-level comparisons of aggregated figures between countries can be difficult. For example, in calculating their overall defence budget, some countries include service pensions and other non-core costs, while others (such as Australia) do not.
- 13 For further details, see Chapter 22 of Peter Yule, Derek Woolner, *The Collins class submarine story*, Cambridge University Press, Melbourne, 2008.

- 14 The implementation strategy, dated 16 November 2012, was never intended to be a publicly available document, and hence is a somewhat dense technical discussion of the way ahead, effectiveness measures, risk matrices and so on.
- 15 Other Navy reform projects, such as the so-called Rizzo reforms of naval engineering capability and the submarine workforce sustainability program, were running concurrently, but funded separately. The costing quoted here doesn't include those activities, although they're noted as being 'enablers and sustainers of the transformation process'.
- 16 Perhaps surprisingly, the same front-loading effect is true even for large hardware projects. For example, the Collins-class build project expended half its budget getting to the delivery of the first of the six submarines.
- 17 And those conversations sometimes occurred well outside the enterprise. It's an odd thing that arcane technical issues can become topics of conversation in defence circles well beyond the immediate cadre of people involved, and remarkably strong views can be held by people who have no professional or commercial interest. I was buttonholed on this topic several times over the years at conferences and other meetings.
- 18 ASC presented the data behind the 'single transition' approach at the 2020 Submarine Institute of Australia conference as part of its presentation, 'Transforming Collins class submarine availability—an ASC perspective'.
- 19 The figures for those years are the result of an ASPI analysis of data from a variety of Defence public information sources from 2013 to 2015 (such as answers to parliamentary questions on notice), and from data presented by ASC to an industry audience in 2018 for the other years. The ASC data is given as the proportion of time that two, three or four submarines were available, and inverting that to obtain a figure for the total annual days of availability has probably introduced some small uncertainties in the figures shown here.
- 20 ASPI's annual defence budget analysis is invaluable, here. Figure 7 draws on data collected over the 2007–2021 period by Mark Thomson and Marcus Hellyer. See 'The Sustainment Program', *The Cost of Defence Public Database*, ASPI, Canberra, 22 December 2021, [online](#).
- 21 The federal election in September 2013 brought a change of government. Senator David Johnston became the Minister for Defence in the Abbott government.
- 22 I recall several discussions along those lines with Sean Costello, who became the Chief of Staff to then Minister of Defence Senator David Johnston in 2014. With that in mind, it's worth clarifying the context of Minister Johnston's very public criticism of ASC in parliament that he 'wouldn't trust ASC to build a canoe'. That was very much concerned with increasingly obvious cost and schedule problems with the Air Warfare Destroyer Project, rather than the by then increasingly healthy submarine support arrangements.
- 23 That's the 15th law from Norman Augustine, *Augustine's laws*, United Press International, 1986.
- 24 For a precis of the program's claims and the RAN response, see Angus Grigg, Michael Reid, Dylan Welch, Jeanavive McGregor, 'Fires, floods, and maintenance delays keep Australia's submarines out of the water as navy begins "high risk" nuclear transition', *Four Corners*, ABC TV, 11 May 2023, [online](#).
- 25 Defence Department, *Study into the business of sustaining Australia's strategic Collins class submarine capability*, report issued by John Coles, Australian Government, November 2012, [online](#).
- 26 Defence Department, *Study into the business of sustaining Australia's strategic Collins class submarine capability: progress review—March 2014*, report issued by John Coles, Australian Government, March 2014, [online](#).

Acronyms and abbreviations

ADF	Australian Defence Force
ASC	Australian Submarine Corporation
ASW	antisubmarine warfare
CASG	Capability Acquisition and Sustainment Group
CCSM	Collins-class submarine
CEO	chief executive officer
DMO	Defence Materiel Organisation
FCD	full-cycle docking
FY	financial year
GBE	government business enterprise
GM	general manager
ISSC	in-service support contract
IT	information technology
LOTE	life-of-type extension
MCD	mid-cycle docking
MoD	Ministry of Defence (UK)
MRDs	materiel ready days
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
TLSA	through-life support agreement
UUC	usage upkeep cycle

ASPI case studies

ASPI case studies in defence projects is a series dedicated to telling the ‘warts and all’ stories of major undertakings in Australian defence procurement and project management. The ‘dates and dollars’ of defence projects are available in reporting from Defence and the Australian National Audit Office, so this series explores the less quantified but nonetheless crucial aspects of project management—the organisational, human and technological challenges that occur along the way. ASPI hopes that future project managers will be able to turn to this series to see how their predecessors dealt with the problems they faced, and be able to see how outcomes—good or bad—were shaped by events along the way.

In 2003, Australia became the proud owner of the last of six new-build Collins-class submarines. Less than a decade later, the fleet was in a poor state of repair, and at times only one or two of the boats were available to the Royal Australian Navy. This account by Andrew Davies explains how the situation was remediated by bringing in a team of highly experienced naval professionals to take an uncompromising look at the arrangements in place to manage a vital national defence asset. Despite a public perception that the submarines were inherently defective, the problems were in fact almost entirely due to dysfunctional and often rancorous organisational dynamics between the key players. In the space of just a few years, and with remarkably little required in the way of additional funding, the situation took a dramatic turn for the better.



About the author

Andrew Davies's career began in the academic world of theoretical physics. He joined Defence as a research scientist in 1993 and was involved in capability analysis and planning and signals intelligence work for over a decade. Andrew joined ASPI in 2006 and became the first director of ASPI's Defence and Strategy Program, where his own work focused on capability analysis, procurement and defence industry. During that time, he became a leading commentator on Australia's submarine capability. He was on the Minister for Defence's advisory panel for the *2016 Defence White Paper* and has taught on intelligence, force structuring and defence technology for the Australian National University and Deakin University.

Acknowledgements

I offer my profound thanks to the people who contributed their valuable time to recount their association with the activities described in this book, and to sometimes make available material that helped shed light on aspects of which I was previously unaware. Without their enthusiasm for filling out the record, this volume would provide a much less full account. That's especially true of the discussion of the organisational politics and relationships—both within Defence and across the broader Collins-class sustainment enterprise—before and after the reforms that followed from the Coles review. Numbers and data allow me to tell the story of the submarines, but the success of the endeavour ultimately depended on resolving previously intractable cultural and organisational issues. For that reason, I've used the words of key participants wherever possible to best reflect the varying perspectives.

Even today there are some disagreements about the roles of the groups involved and about the importance of various factors. Any judgements made or inferences drawn about those or any other issues presented here are entirely my own.

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Andrew Davies
Canberra, 2024

ASPI case studies in defence projects

Nobody wins unless everybody wins: The Coles review into the sustainment of Australia's Collins-class submarines

In 2003, Australia became the proud owner of the last of six new-build Collins-class submarines. Less than a decade later, the fleet was in a poor state of repair, and at times only one or two of the boats were available to the Royal Australian Navy. This account by Andrew Davies explains how the situation was remediated by bringing in a team of highly experienced naval professionals to take an uncompromising look at the arrangements in place to manage a vital national defence asset. Despite a public perception that the submarines were inherently defective, the problems were in fact almost entirely due to dysfunctional and often rancorous organisational dynamics between the key players. In the space of just a few years, and with remarkably little required in the way of additional funding, the situation took a dramatic turn for the better.

As with earlier ASPI case studies on defence projects, *Nobody wins unless everybody wins* is designed to help those in Defence, industry and parliament and other interested observers to better understand the complexities of the business, all with the aim of improving how Australia equips and sustains its defence force.

Andrew Davies's career began in the academic world of theoretical physics. He joined Defence as a research scientist in 1993 and was involved in capability analysis and planning and signals intelligence work for over a decade. Andrew joined ASPI in 2006 and became the first director of ASPI's Defence and Strategy Program, where his own work focused on capability analysis, procurement and defence industry. During that time, he became a leading commentator on Australia's submarine capability. He was on the Minister for Defence's advisory panel for the *2016 Defence White Paper* and has taught on intelligence, force structuring and defence technology for the Australian National University and Deakin University.