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The once and future submarine—raising and sustaining Australia's underwater capability

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78

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Introduction

The future expansion of Australia's submarine fleet was a centrepiece of the 2009 Defence White Paper. Six *Collins* class boats are to be replaced with twelve long-range submarines built to perform a range of demanding tasks.

The White Paper made two things known; the submarines will be built in Adelaide and they will not have nuclear propulsion. Assuming that the White Paper's specifications are not carved in stone—and it will be shown later that there are good reasons to hope that is not the case—virtually everything else will need to be determined as part of a project that will span decades and almost certainly be the most expensive defence undertaking Australia has ever committed to.

The White Paper was released two years ago, and no progress or even preliminary decisions have been made about the project since then. This is unfortunate; working through the options early is likely to be crucial. Table 1 shows how the scope and projected cost of the *Collins* program evolved over the lifetime of the program.

Table 1: *Collins* submarine program—changes in scope and cost

First concepts, late 1982	1983, prior to feedback from industry	May 1985, selection of short list	May 1987, selection of the winning tender	December 1999
A 10 boat program at over $220 million each	4 to 8 boats $3.0 billion	6 boats $2.6 billion	6 boats $4.7 billion	6 boats $5.33 billion

All prices are quoted in 2000 dollars
Sources: Derek Woolner, 'Getting in early' and 'Procuring change'.

The Kinnaird Review, which introduced the two-pass approval process used in Defence acquisition today, recommended that funds be spent early in a project to retire risk, choose between competing technologies and build understanding of the likely costs. Before final approval, Kinnaird recommended that 10% to 15% of the project budget could be usefully directed towards refining the proposal(s) before proceeding to tender. In the case of the future submarine, that could amount to over a billion dollars.

Despite that, there has been no visible allocation of funds in the last two federal budgets for the submarine project. So any work that has been done has been funded at a relatively low level from within Defence's existing allocations.

It appears that the future submarine project is marking time. And that is a cause for concern. To those close to the world of submarine design and operations, the clock was already ticking in 2009—the lead-time to design, build, test and evaluate a new submarine is likely to be fifteen years or more, about the same as the remaining life expectancy of the *Collins* fleet. Time is already running out. This paper discusses the possible consequences of continued vacillation.

The timeline

The obvious benchmark for the future submarine timeline is the *Collins* program. Table 2 shows the major milestones of the process. Note that this timeline makes the process look considerably more linear than was actually the case—especially in the first few years.

Table 2: *Collins* submarine project timeline

1981-82	Budget decision to build a new class of submarines in Australia.
1983	Call for registrations of interest from suppliers of 'modern integrated combat systems'. Request for Tender issued to industry for a design based on 'tried and proven designs'.
1984	Assessment of competing designs shows that there is a conflict between Navy's requirements and the objective of using a proven design.
1985	Navy concludes that none of the designs then available could meet its expectations, instead choosing to proceed to a unique submarine design. Cabinet approves the selection of the two companies left in the running to develop the design. Defence Minister Beazley commissions a review of the project that confirms the decision to pursue a unique design.
1987	Selection of the winning tender; contract signature (June). Construction of the ASC site in South Australia commences.
1989	ASC site completed.
1990	First boat in class, HMAS *Collins*, begins construction (February).
1993	'Launch' of (incomplete) HMAS *Collins.*
1994	HMAS *Collins* completed and readied for sea trials.
1995	Final boat in class, HMAS *Rankin* laid down.
1996	HMAS *Collins* delivered to navy and commissioned.
1999	Report commissioned on problems with *Collins* class submarines.
2003	HMAS *Rankin* commissioned.

Source: Derek Woolner, The Collins class submarine story.

From initial decision to contract signature was six years; contract signature to first boat in service took another nine and the last of six boats was commissioned twenty-one years after the initial decision was made. Given the hiatus since 2009, the earliest that a serious first step could be taken commensurate with the 1983 Request for Tender would be 2012. On this basis, it's not unreasonable to think that

delivery of the first of the new class might occur around 2025. The sixth might arrive around 2031 and the twelfth couldn't be expected before the late 2030s. So even if we start now, we would only just make the 2026 to 2030 window when the present six *Collins* boats are due to leave service.

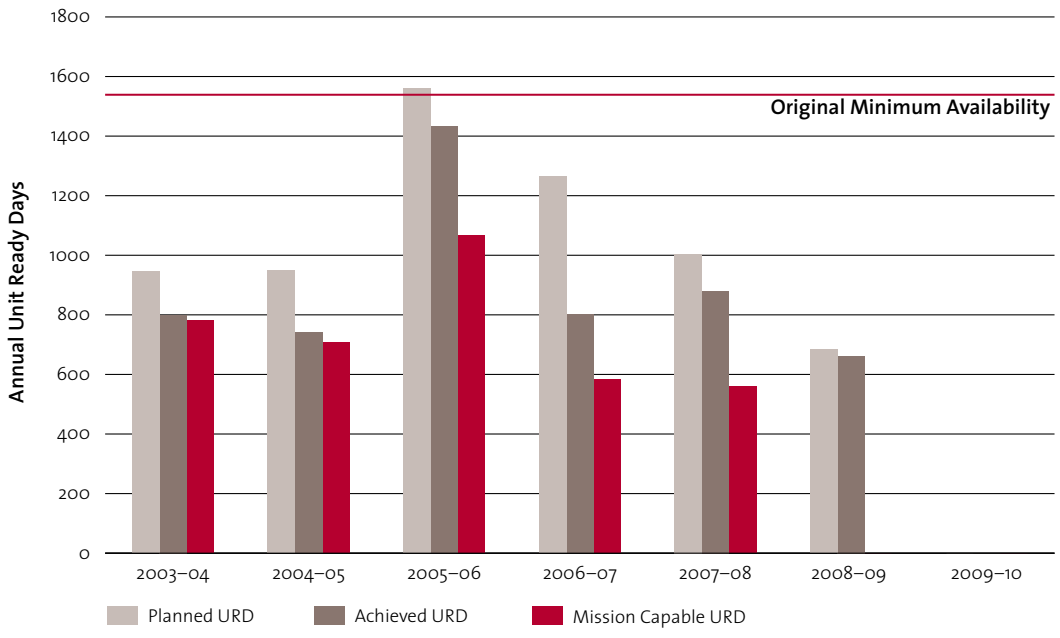
The *Collins* experience with schedule is not out of the ordinary. Even entirely 'off-the-shelf' submarines take a long time to deliver. Pakistan signed a contract with DCN of France for three *Agosta* class submarines in October 1994, took delivery of the first (built in France on an existing production line) in 1999, but had to wait until late 2003 to commission the first boat built in Pakistan and until 2008 for the third (albeit with air independent propulsion, which was not fitted to the first two). Brazil signed a contract with DCN in late 2009 for four S-BR submarines, which are derivatives of the *Scorpene* class, for delivery in 2017, 2018, 2020 and 2021 respectively.

Of course, a developmental program to produce an entirely new submarine design (which is all but implicit in the specifications outlined in the 2009 White Paper) would take much longer than one evolved from an existing design like the *Collins.* Even for an established submarine builder such an undertaking could take twenty or more years.

From *Oberon* to *Collins*

There's a natural temptation to judge that no big investment on future submarines is justified with the *Collins* fleet only now (perhaps) starting to emerge from a period of severe mismanagement which resulted in unacceptably low levels of availability and capability. The whole idea has the feel of 'throwing good money after bad'. Figure 1 shows the steady decline in *Collins* availability over the previous four years. Given this picture, it is little surprise that figures for submarine readiness have been withheld from the public in part since 2008–09 and in full since 2009–10. Note that in every year the number of 'mission capable' Unit Ready Days is less than the number achieved, which is less than the number planned. Note, moreover, that the level of availability is well below the minimum originally sought by the *Collins* project.

Figure 1: Diving deep—*Collins* availability 2003–2009

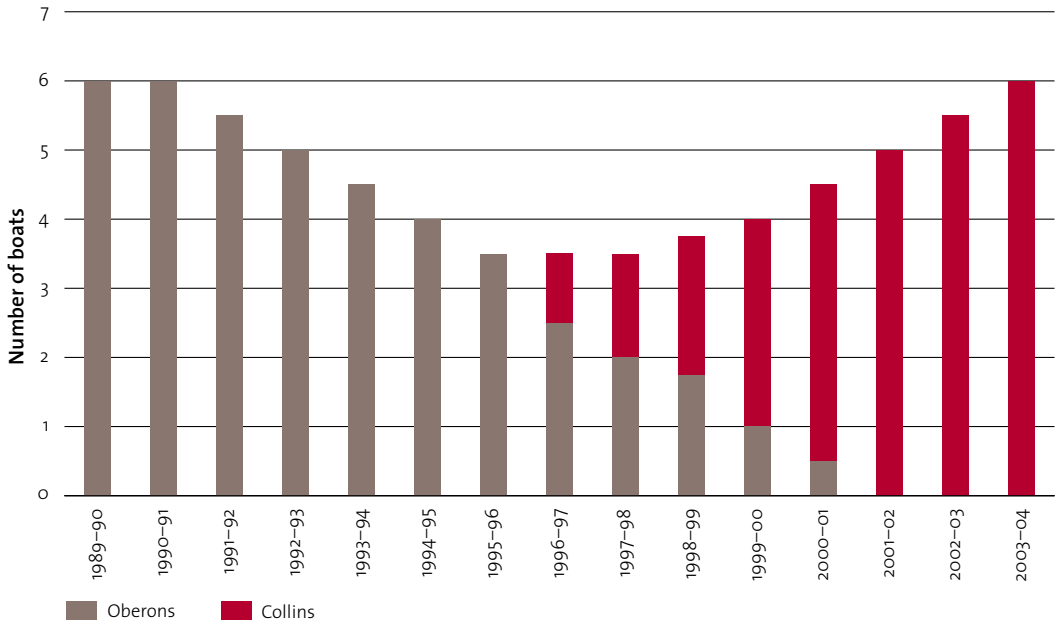


Sources: Royal Australian Navy, Submarine Institute of Australia

Based on public statements, the situation depicted in Figure 1 may have improved somewhat recently. Doubtless there is a strong temptation within government to wait a while to see if there is real systemic improvement rather than a 'false dawn' before investing heavily in the future submarine project. However, that approach runs the risk of leaving a significant gap between the eventual run-down of the *Collins* fleet and the introduction of its replacement. And we've been there before. Delays in the delivery of the *Collins* boats and the time taken to rectify their initial problems (which are almost guaranteed in a new design) meant that the *Oberon* class they were meant to replace had reached life-of-type several years before there was an operational replacement capability. The gap between the two classes saw steady erosion in both the number and the skills of the Navy's submariners.

Figure 2 shows the number of commissioned submarines in the RAN from 1990–2004. At its lowest point, the RAN had half the planned number of submarines in service and little real capability due to the declining availability of the remaining *Oberons* and the well-documented teething problems of the *Collins* boats in their early days. The total shortfall in availability in that transition was twenty submarine-years.

Figure 2: The *Oberon–Collins* transition



Sources: Defence Annual Reports and Portfolio Budget Statements

At its peak, the *Oberon* fleet was characterised by strong morale and a high level of skills honed during the Cold War—the underwater component of which saw Australia's submarines making a significant (if largely undocumented) contribution. As the looming gap became obvious in the second half of the 1990s, sterling efforts saw a couple of the *Oberons* retained in service, but at what was then a significant cost and with diminishing returns in terms of availability and capability. A number of experienced submariners left the service due to the lack of opportunities to practice their trade, resulting in a decline in numbers and expertise that is still being felt today.

The lack of available submarines does not just affect the ability to conduct submarine operations. Surface and aerial platforms need to practice Anti-Submarine Warfare (ASW) against realistic targets. Indeed, the initial purchase of the first four *Oberon* class boats in the 1960s was made primarily with this in mind, with the RAN only later developing the experience and doctrine to employ the

submarines on other operations. It is no coincidence that the ADF's ASW capability has been in steady decline for the past couple of decades—although other factors have also played a role in that sorry tale.

And what of *Collins*?

Clearly then, decisions are needed soon to avert a repeat of the unsatisfactory *Oberon* to *Collins* transition. If a gap develops, it may be necessary to extend the life of the *Collins* fleet. In one respect this is tempting; the boats have spent so little time in the water due to maintenance and crewing problems that the hulls have not been pressure cycled anywhere near to the extent anticipated. However, a life-of-type extension for the *Collins* is not an especially appealing prospect for a number of reasons.

To start with, the drive train in the *Collins* has been problematic since day one, and attempts to keep the fleet going into the late 2020s would almost certainly require work to replace the highly problematic diesel engines (which are already 'orphans' in the world of maritime diesels). That alone is an undertaking requiring major engineering work, not to mention a lot of money. It is a simple fact of geometry that the engines can only be removed by cutting the pressure hull. Given that less complex mid-cycle dockings are taking 100 weeks to complete (against an anticipated 52 weeks), this exercise would result in considerable downtime. It could be that every five years of additional life would come at the cost of one or two extra years out of the water and/or conducting sea trials for each boat being upgraded. This would further exacerbate the already disappointingly low availability of the fleet.

In any case, even with a life-of-type extension, the *Collins* would still lack many of the capabilities required at the 'top-end' of submarine operations—most notably air independent propulsion—to which the replacement submarine specification aspires. If Australia requires a 'top shelf' submarine in the second half of the 2020s as the White Paper suggests, an upgraded *Collins* is not the answer.

So the government has decisions to make. First and foremost, it has to decide what strategic outcomes it expects from its submarine fleet. Although the 2009 White Paper was remarkably prescriptive about the range of capabilities sought—long-range, land-attack cruise missiles, air independent propulsion, special force insertion and extraction—this should not be treated as holy writ. It is an old strategy of defence planners to try and lock governments into grandiose projects before the costs and risks are known. The government would be well advised to look closely at the costs, risks and prospective worth of every aspect of the future submarine project.

There are likely to be many trade-offs decided along the way. In reality, the White Paper discussion of the future submarine included some capabilities that are probably 'nice to have' rather than essential. The primary role of a conventional submarine is operations against other submarines and surface vessels. They can also gather intelligence, surveillance and reconnaissance data, but that is secondary to their main role. Nonetheless, intelligence gathering was a frequent peacetime task for the *Oberon* class boats and there is no doubt that there were associated training benefits and familiarisation for wartime duties.

Ultimately, however, submarines are war-fighting platforms and there is no reason to think of them otherwise. So the discussion needs to be in the realm of potential future wars, not least in terms of the 'who' and the 'where.' These considerations should be the ultimate drivers of the future submarine project. The further from home base the submarines operate, the larger the boat will tend to be, making the technical specifications more demanding—and the acquisition phase riskier and more expensive.

The other capabilities described in the White Paper, including land strike and the delivery and recovery of Special Forces teams, are on the wish list of ADF planners but don't seem to offer an effect of a strategic scale. We are more likely to annoy than overwhelm an adversary with what's planned. The US Navy's submarines and ships have fired hundreds of land-attack cruise missiles at targets in modest powers such as Iraq and most recently Libya. But, while having useful tactical effects, they have never proven decisive in the wider conflict. Against major powers that conclusion will be even starker. Similarly, while the ability to deliver small groups of Special Forces might be useful, it's a high-risk/low-benefit capability which is not the 'main game' for a multi-billion dollar naval platform.

All these questions have to be answered by balancing strategic ends and means against likely project risks and costs. Broadly speaking there are four options (in likely order of cost and risk):

- an off-the-shelf submarine (probably from a European design house)
- build more *Collins* with a degree of modernisation but no large-scale changes
- a '*Collins* plus' that draws on and extends the existing submarine design
- a totally new bespoke design.

Each of these options has its pros and cons, but the first and the last are the ones with the most vocal advocacy groups. According to which camp is putting forward their case, the supposed likelihood of success with a completely new design depends largely on whether the *Collins* can be seen as a salutary lesson in what not to do, or as a necessary learning step before moving onto something more complex. In truth it is a bit of both. To complicate matters further, there is the question of industrial execution, which was discussed at length in the earlier ASPI paper *How to buy a submarine*.

Some preliminary design work and analysis is needed to assess the merit of possible inclusions in the context of the overall design and industry options. If the inclusions came along for little additional cost and technical risk—such as torpedo tube launched land-attack missiles compatible with the combat system—they might be worth including for their potential, albeit limited, tactical effect. If they required extensive additions to the hull—such as vertical launch tubes for missiles or purpose-built chambers for Special Forces—they are likely to be more trouble than they are worth. As the future submarine project evolves, ASPI expects to revisit many of these issues.

Conclusions

The dual problems of fixing the current *Collins* fleet and defining and building its replacement are best tackled together. The goal should be to ensure a continuous submarine capability for Australia. A 'stop-start' approach to capability is a recipe for problems. The RAN's submarine arm still hasn't recovered from the loss of personnel and expertise it suffered when it lost two decades of submarine running time in transitioning from the *Oberon* to the *Collins*.

Waiting for the *Collins* availability and nagging legacy design problems to be fixed before investing in the future fleet may seem prudent, but a transition that is botched by even a few years could result in a substantial capability gap opening up some time in the next decade—at a time when strategic competition in the Asia–Pacific region has the potential to ramp up.

There are questions to be answered at almost every level; from the strategic—what sort of wars do our planners envisage our submarines being asked to fight—down

to the deeply technical—what sort of air independent propulsion is the best option for future Australian submarines?

Many of these questions need to be answered in the near future. Some appear at first glance to be policy decisions and others engineering choices, but there is a strong interdependence between the two. The government needs to start thinking hard about the balance of cost, capability and risk it is prepared to pursue. To make sure it has the information at hand to make well-informed decisions, it will probably have to make some sizeable investments to obtain quality data. Otherwise, as more time slips past, the range of options will narrow and Australia may be driven by default down paths that would not be the first choice.

Sources and further reading

The story of the *Collins* class project is well documented. The following works provide a comprehensive overview.

Peter Yule and Derek Woolner, *The Collins Class Submarine Story: steel, spies and spin*, Cambridge University Press, Port Melbourne, 2008.

Derek Woolner, *Getting in Early: Lessons of the Collins Submarine Program for Improved Oversight of Defence Procurement,* Department of the Parliamentary Library Research Paper No.3, 2001–02.

Derek Woolner, *Procuring change: how Kockums was selected for the Collins class submarine,* Department of the Parliamentary Library Research Paper No.4, 2001–02.

Malcolm K McIntosh and John B Prescott, *Report to the Minister for Defence on the Collins class submarine and related matters*, Commonwealth of Australia, June 1999. Available at http://www.minister.defence.gov.au/1999/collins.html

The future submarine will be shaped by the possible wars it is required to fight. The impact of likely range and endurance requirements is discussed in 'Fighting the far war: Australian submarines in the Asia–Pacific', Andrew Davies, *Australian Defence Magazine*, April 2011, pp. 44–48.

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