

## ADF capability snapshot 2015

### Part 2—RAN

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This paper surveys the capability of the Royal Australian Navy and is an update of a previous ASPI review in 2010. The other three papers in this series update the corresponding reports on Royal Australian Air Force, Army and ADF C4ISR (command, control, communications, computers, intelligence, surveillance and reconnaissance) capabilities.

### RAN capability summary

In some ways, the Royal Australian Navy (RAN) is now at a point the Royal Australian Air Force was at about five years ago. There are legacy platforms in service that have already seen their best days, such as the Adelaide-class frigates (FFGs). New platforms now being delivered—combat helicopters, landing helicopter docks (LHDs) and air warfare destroyers (AWDs)—will provide a significant boost to capability. And, most significantly—there are plans to recapitalise most of the rest of the fleet over the next couple of decades.



A CH-47 Chinook conducts trials with HMAS Canberra off the coast of New South Wales. Photo courtesy Department of Defence.

Most of the capability problem areas identified in ASPI's last RAN 'capability snapshot' in 2010 have been at least partially addressed through a combination of development activities, acquisitions and improved management of existing assets. While not all capability shortfalls have yet been fully remedied, things are clearly moving in the right direction (see Table 1).

These are heartening observations, because the Navy produced a number of disappointing capability outcomes over the past decade, including an effective collapse of the submarine capability in 2009–10 (under 400 unit ready days against a benchmark of 1,200, including a short period of no submarine availability at all). The amphibious capability suffered a similar fate in early 2011, when there was no vessel available to respond to the threat posed to eastern Australia by Cyclone Yasi.

But the Navy also had some significant successes in the same period. There's been an RAN frigate on station in the Middle East area of operations or off the east coast of Africa on continuous rotation for well over a decade—no small feat for a smallish surface fleet. And those deployed vessels have consistently been able to embark a helicopter that has allowed for boarding operations and movements of personnel and materiel between vessels. Again, that's a good effort, given continuing obsolescence and supportability problems with the ageing fleet of SH-60B 'Bravo' Seahawks.

The capability of the surface combatant fleet has been improved through the successful upgrade of the air defence capability of the Anzac frigate fleet, with the CEA Technologies phased array radar and Saab 9LV combat system combination now well proven. The fleet's combat aviation capability is also undergoing a significant capability boost through the progressive delivery of the MH-60R 'Romeo' model Seahawk combat helicopter and the capabilities it brings—for the first time in two decades, the RAN will have an active dipping sonar in its inventory.

Perhaps the most noticeable capability boost is to amphibious lift. After all, it's hard to miss the 27,000-tonne HMAS *Canberra*, the first of two LHDs, which will provide a quantum leap in amphibious capability. It will take time for the full amphibious capability involving Army force elements (troops, vehicles and helicopters), naval helicopters and landing craft and the required command and control components to mature into an 'across the beach' capability, but the boost in sealift capacity will be immediate. The LHDs augment the HMAS *Choules*, an ex-Royal Navy amphibious ship hurriedly acquired in response to the 2011 events.

The implementation of the [Coles Review](#) into the maintenance of the Collins-class submarine fleet, which has led to a concerted effort and the investment of considerable funds, has substantially improved submarine availability. The 2013–14 result of over 900 unit ready days was the best outcome since 2005–06 (still the only year for which the international best practice outcome of 1,200 days for a six-boat fleet was achieved). Clearly, there's still a way to go if the benchmark is to be met in 2016–17 as currently planned, but the trend is positive. A potential added complication in future is the possibility of additional work needing to be done to extend the life of the Collins fleet to avoid or minimise a capability gap before the delivery of the planned replacement submarine.

One downside to an otherwise positive trend for Navy capability is the minor vessel fleet. The rate of effort required to support border protection operations has resulted in a decline in the serviceability of the Armidale-class patrol boats. An announcement of a new building program for minor vessels in August this year seems predicated on an early replacement of the Armidales with larger vessels. That makes sense, given the likely ongoing demand for patrol and response over a large area with highly variable sea conditions. The fleet of six Huon-class minehunters was the victim of austerity measures in 2011, when two were placed permanently on reserve—although it's arguable whether they remain viable, or whether enough trained personnel would be available in any case.

As noted in the RAAF capability update in this series, there's an ADF-wide capability shortfall in antisubmarine warfare (ASW)—a situation that's been inadequately addressed for at least a quarter of a century. The Romeo model Seahawks will bring a much-needed boost and will greatly improve the ability of the fleet to engage hostile submarines and to collect over-the-horizon ASW data (though it would be better if there was the capability to transmit such data in real time—see the forthcoming C4ISR capability update for a discussion). The improvement in helicopter ASW has to be tempered by the observation that the surface-combatant organic ASW capability is increasingly dated and won't substantially improve until the delivery of the three AWDs from 2017 and especially the future frigate sometime next decade. Given the proliferation of submarines around the Indo-Pacific, this is a significant shortcoming.

Table 1: Significant capability changes since ASPI's last update in 2010

Capability	Change	Comment
Surface combatants	↑	The combination of the Saab 9LV combat system and the CEA phased array radar on the Anzac-class frigates (so far, five of the eight have been upgraded) has transformed the vessels into extremely capable air defence platforms. Arguably, they are now the best 3,000-tonne frigates in the world in that regard. New combat helicopters (see below) are adding to the surface navy's capability.
Submarines	↑	The main change in submarine capability in the past five years has been the improvement in availability of the Collins-class boats and a modest increase in manning levels. Both of these improvements are due to improvements in business processes and management practices.
Naval aviation	↑	The acquisition of 24 new-build MH-60R 'Romeo' combat helicopters will see a quantum leap in naval combat aviation. The Romeos will bring improved sensors and communications suites, return dipping sonar to the fleet for the first time in 20 years, and be equipped with a modern airborne lightweight ASW torpedo.
Amphibious lift	↑	The Canberra-class LHDs will provide capacity for sealift and amphibious lift beyond anything the ADF has ever had. HMAS <i>Choules</i> has provided a useful interim capability.
Antisubmarine warfare (ASW)	↑ (work in progress)	See the comments above on the Romeo helicopter. The improvement in ASW thus delivered has to be tempered by the observation that the surface-combatant organic ASW capability is increasingly dated and won't substantially improve until the delivery of the three AWDs and—especially—the future frigate sometime next decade.
Patrol boats	↓	The serviceability of the Armidale-class patrol boat fleet has suffered due to high rates of effort.
Minehunting	↓	The minehunting capability provided by the Huon class has declined, with two of the six vessels being removed from active service and others being sometimes used for border protection tasks.

Table 2: Navy capability shortfalls

Capability	Risk assessment	Comment
Submarine capability	Medium	While improvements in submarine availability have effectively doubled the active submarine fleet compared to the near collapse of the capability in 2009–10, there's still some way to go before best practice is reached. This is a significant shortfall, given the small size of the Collins fleet.
Antisubmarine warfare	Medium/high	ASW capability across the ADF has been in a poor state for an extended period (see also the notes on ASW in the RAAF capability update). A modernised ASW capability will take years to rebuild and won't be complete until the future frigate is operational—perhaps after 2025.
Minor vessels (patrol and minehunting)	Medium	The serviceability of the Armidale-class patrol boats has declined as the fleet has been driven hard in border protection operations.  The fleet of six Huon-class minehunters has been reduced to four following a decision to remove two from active service, and the remaining vessels are sometimes deployed on border protection duties.

As noted in the RAAF capability review, the Abbott and Turnbull governments have continued to consider and approve projects in parallel with the development of the Defence White Paper. That's certainly true of naval projects: two continuous build programs for major and minor naval vessels were announced in August this year, albeit with few details. There are still some unresolved questions—not the least of which is how large the fleet of future frigates will be. Table 3 summarises significant Navy capability announcements since 2010.

Table 3: Significant Navy platform and system announcements since 2010

Project	Number	Comment
Future surface combatants	?	A continuous build program for future major surface combatants to be delivered under project SEA 5000 and commencing in 2020, was <a href="#">announced in August 2015</a> . Details are few, but the forthcoming Defence White Paper will provide more information. Of particular interest will be the total number of surface combatants—which will set the build rate of future vessels, their expected lifetime, or both.
Future submarine	12?	In February 2015, the government announced that the SEA 1000 project that will deliver the future submarine is now subject to a <a href="#">competitive evaluation process</a> (CEP) that will evaluate bids from France, Germany and Japan. In June 2015, the government appointed an <a href="#">expert panel</a> to oversee the probity of the process. Bids for the CEP close in November this year, and a down-select decision is expected in March 2016. No formal announcement on the number of submarines to be acquired has been made, but the number's now widely believed to be fewer than the 2009 Defence White Paper's 12.
Offshore patrol vessels	?	In <a href="#">the August 2015 announcement</a> about the surface combatant continuous production plan, the government also announced that it was bringing forward by two years the construction of offshore patrol vessels under project SEA 1180 to replace the Armidale-class patrol boats. As with the major surface combatants, there'll be a continuous onshore build, commencing in 2018 following a CEP. Again, details are to follow.
At-sea replenishment vessels	2	A two-ship build to replace the two at-sea replenishment vessels HMA Ships <i>Sirius</i> and <i>Success</i> was <a href="#">announced in June 2014</a> . The process to decide where the ships will be built is a restricted competition between Navantia of Spain and Daewoo Shipbuilding and Marine Engineering of South Korea.
Training helicopters and aviation training vessel	15 1	Under project AIR 9000 Phase 7, the government <a href="#">announced in October 2014</a> that the ADF will acquire a new helicopter aircrew training system, based at HMAS Albatross in Nowra. Training will be based on 15 Airbus EC-135 twin-engine 'glass cockpit' training helicopters plus simulators. The Navy's new seagoing aviation training vessel is being built in Vietnam.
MH-60R combat helicopters	24	In September 2011, <a href="#">the government announced</a> the acquisition of 24 MH-60R 'Romeo' combat helicopters at a total cost of around \$3 billion.

Table 4: Future developments and possible acquisitions

Unmanned aerial and underwater systems	Like all sophisticated navies, the RAN will be keen to make use of unmanned technologies that can expand the capabilities of its platforms. Unmanned aerial systems can augment manned helicopters, and potentially bring the additional benefit of longer sortie times and the ability to replace manned aircraft in tedious tasks where persistence is important, such as over-the-horizon communication relays or wide area search activities. Similarly, unmanned underwater vehicles can extend the effective range of submarine sensors, and can be projected forwards into potential operational areas ahead of the manned platform.
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## RAN capability report

The RAN operates a fleet comprising surface combatants, submarines, amphibious assault vessels, patrol boats and support vessels, as well as a range of helicopters. It's a little larger than the navies of countries such as Singapore and Thailand, but much smaller than those of China, India and Japan. The RAN is in a period of rejuvenation and recapitalisation following a period in which there were several significant capability failures and shortfalls, and good progress is being made in remediation. The modest expansion likely to follow from recent decisions on surface combatants, minor vessels and potentially submarines in future will add to the RAN's capacity and increase its capability in a number of areas, but won't significantly change Australia's naval capability relative to the larger Asian powers.

In terms of capability, the RAN is a middle-power force with no fixed-wing air power and with frigates forming the core surface combatant capability. The absence of an aircraft carrier in the fleet (and the other elements of a carrier battle group required for escort) circumscribes the range of operations that the ADF can undertake. The principal operator of carriers, the US Navy, can project air power and provide air cover for naval and land-based operations in hotly disputed areas. Recent developments will see other nations achieve similar capability, although they won't match the capacity of the US in the foreseeable future. The only other carrier operators in the Asia-Pacific are China, India and Russia. Russia operates a single carrier, providing limited naval air power. India operates two carriers and is building its own indigenous design. Aircraft carriers are extremely expensive to acquire and operate, and there's little prospect of Australia deciding to once again field a carrier. While the idea of operating fixed-wing F-35B jump jets from the Navy's two Canberra-class LHDs was investigated, it's believed to have been shelved.

Of the other Asia-Pacific navies, those of Japan and South Korea currently operate what we would term air warfare destroyers (AWDs)<sup>1</sup>, a capability that the RAN will take delivery of from 2017 onwards when the first of three Hobart-class DDGs is delivered. The two Canberra-class LHD amphibious ships will put the RAN in the first rank of regional amphibious capability. For the past 15 years, Australia's Collins-class submarines have provided a capability edge in underwater warfare (albeit with less than desired capacity due to availability problems). Today, other regional nations are buying or developing capable diesel-electric and (in the case of India and China) nuclear submarines, so Australia's naval forces will be increasingly operating in an environment in which sophisticated submarines are the norm and the capability edge currently provided by the Collins will steadily erode.

While this paper focuses on the Navy, in many instances naval elements combine with other services to provide a joint ADF capability. For example, the RAAF contributes to ASW through its P-3 Orion patrol aircraft and to fleet air defence through its air combat capability. And the amphibious ships will enable joint operations with the Army (see the forthcoming Army capability review in this series for further discussion).

## Surface combatants

Surface combatants represent the Navy's largest investment and will probably continue to do so even if the submarine fleet doubles in size, as the next-generation frigates are likely to be significantly larger and more capable than the current ones—and thus also more expensive. Surface combatants fulfil a wide variety of roles, including high-end warfighting, the protection of sea lanes, escorts for shipping and interdiction tasks. They can operate far from base and, unlike aircraft, maintain a persistent presence relatively easily. Australian surface combatants have operated in the Persian Gulf or off the Horn of Africa on an almost continuous basis since 1990 through the Gulf War and the Iraq War, and continue to do so today.

To carry out the full range of envisaged tasks, surface combatants need to be able to defeat threats in the air, surface and subsurface domains. They can also be used to engage targets on land with gunfire and provide support to land operations. In a world increasingly characterised by long-range sensor and targeting systems and precision guided weapons, surface ships have to embark an increasingly sophisticated suite of defensive systems if they are to survive in a high-threat environment.

The RAN's surface combatant force is in transition, and the end state will reflect the challenging world described above. The fleet suffered a significant reduction in its area air defence capability in the early 2000s with the retirement of its three Perth-class guided missile destroyers (DDGs). It has only recently reacquired an interim air defence capability in the form of the upgraded Anzac-class frigates fitted with CEA Technologies' CFAR phased array radar and Saab's 9LV combat system, which has improved the ability to track and engage multiple air targets. The ability of the fleet to defend itself against low- to medium-level air threats has been boosted considerably by that upgrade, but the ability to operate in a high-threat environment will await the delivery of a dedicated AWD. The AWDs' Aegis combat system and air defence radar will provide the fleet with additional area air defence and situational awareness capability. There's also a possible future growth path that would see the AWDs fitted with a cooperative engagement capability that will allow them to exchange targeting data with Wedgetail AEW&C aircraft, enabling the ship to engage targets with the 375-kilometre range SM-6 missile from well beyond the ship's radar horizon.

In the open ocean, the fleet's organic ASW capability must be provided by surface vessels and their embarked helicopters. After a long period of lagging best practice, the helicopter ASW capability is currently being brought up to contemporary standards as the MH-60R version Seahawk is delivered. Current FFG and Anzac ASW system shortfalls include the lack of low-frequency hull-mounted sonars and the lack of a variable depth sonar capability. Towed sonar arrays are useful ASW sensors, but limit manoeuvrability while deployed.

Airborne ASW sensors and weapons are getting a much-needed overhaul with the delivery of the new Romeo model Seahawks. However, the overall capability to conduct ASW operations remains marginal, due especially to deficiencies in shipborne sensors. The embarked helicopter is a vital part of the ASW system but it can't be airborne 24/7, so capable ship-based systems are also required. Despite their name, the 'air warfare destroyers' (which are correctly designated DDGs—guided missile destroyers) are, like most modern surface combatants, multi-role vessels. As such, they'll have capable ASW sensors in addition to their extensive air defence capabilities and so will provide an ASW capability boost from 2017 onwards. However, the AWD's air defence role will constrain its ability to conduct effective ASW operations simultaneously.<sup>2</sup>

The AWDs will be followed by the future frigates sometime next decade and only then will the surface fleet have modern air defence and ASW capabilities. While the future frigates are often referred to as 'ASW frigates'—a description that appeared in the 2009 Defence White Paper—they too will be multi-role vessels. Nonetheless, there are degrees of specialisation, and some features of the future frigates will have more application for ASW than other roles. For example, it's likely that a 'must have' capability will be the capacity to embark two helicopters, while the current FFG and Anzac surface combatants and AWDs carry only one each.<sup>3</sup>

## Submarines

The RAN's Collins-class submarines were designed from the outset for a far-ranging role, as reflects Australia's strategic environment. A long-range, high-endurance submarine means that potential adversaries can't assume that their home ports and coastal waters are safe refuges. The high-level requirement was for the ability to keep two boats on patrol at 2,500 nautical miles from base, with each able to remain at sea for 60 days. This means that Collins submarines can maintain standing patrols or collect intelligence well into the Indian Ocean or into North Asia. These demanding requirements mean that no 'off the shelf' submarine will adequately meet Australia's needs.

After a sometimes troubled development period, and notwithstanding the poor management of both the boats and their crews for much of the 2000s, the Collins-class boats are capable conventional submarines that are highly thought of by allied nations, which have experienced great difficulty when facing them in exercises. Their submerged dash speed and endurance are superior to their predecessor Oberon class, and they can stay at sea for longer and have a greater ability to remain submerged than comparable diesel submarines. The Collins boats are also formidable anti-surface warfare (ASuW) platforms, armed with wire-guided torpedoes and Harpoon anti-ship missiles.



Being conventional diesel-powered submarines, the Collins boats can't match the speed of surface vessels during a transit, and so can't provide ASW escort for a transiting task group. Instead, submarines would be dispatched to take up patrol in the forward area where amphibious lodgements would be conducted in advance of a task group sailing.

The capacity of the Collins fleet for concurrent tasking is limited by its size and by substandard levels of availability. The 'rule of three' heuristic should see two boats available at short notice, two more available for rotation at longer notice and two in deep maintenance at any given time. That has often not been the case, and even the substantial improvement in availability that followed the Coles review into fleet management still falls well short of the international benchmark identified by Coles. Given the vital role that the Collins-class boats play in ASW and ASuW, any shortfall in the availability of what's already a small fleet is significant. But even if the Coles benchmark were to be achieved, sustained simultaneous deployments, especially for contingencies far afield, would leave little in reserve for other tasking. Ultimately, a six-boat fleet is small compared to the demanding tasks that Australia requires its submarines to be able to achieve—hence the plans to expand the fleet.

The future submarine has been the subject of many articles (a fair fraction of which have been from ASPI). For this capability review, the most significant fact is that a future boat might be as much as 12 years away from initial delivery, which has implications for managing the Collins fleet. Under a periodic refit regime, the Collins boats receive progressive upgrades to their sensors and other systems to keep them near the forefront of conventional submarine capability. However, as they age, that will become harder to achieve as developments by other submarine manufacturers erode their qualitative advantage. That will be most significant in submarine versus submarine operations. Given that the more than six years since the 2009 Defence White Paper has produced far less progress on a replacement submarine than was desirable, it's likely that a substantial technological refresh of Collins systems will be required if a capability gap in the 2020s is to be avoided.

Finally, the possibilities afforded by unmanned underwater vehicles (UUVs) will become increasingly important for future submarine operations. But they'll complement rather than replace manned vessels, at least for the foreseeable future, and the future submarine can be expected to progressively incorporate such systems as they evolve. Given that an important class of UUVs will be ones that can be launched and recovered from standard torpedo tubes, it's also possible that the Collins fleet will trial this technology before its deployment with the future submarine.

## Naval aviation

Embarked helicopters are an important component of the systems of naval surface units. In warfighting roles, they greatly extend the reach of the ships' weapons and sensors, enabling over-the-horizon search and strike and ASuW and ASW missions with missiles and torpedoes. Utility helicopters are useful for more mundane duties, such as the transfer of personnel and materiel between vessels and from ship to shore, and for search and rescue. At the time of the previous ASPI capability review, the RAN had sixteen Sikorsky S-70B-2 Seahawks in the combat role and six Westland SK-50 A/B Sea Kings in the utility role. The Sea Kings have since been replaced by the same number of MRH-90 multi-purpose helicopters, which are drawn from a common pool shared with the Army. The Bravo model Seahawks are being replaced with MH-60R 'Romeo' models, which are essentially identical to aircraft in service with the US Navy.

The Romeo is a major step up in capability. The fleet has been without a dipping sonar for submarine detection since the systems were retired from the Sea Kings in 1996, and the Mark 46 ASW torpedo carried by the Bravo is largely obsolete. The Romeo acquisition fixes both shortcomings, coming with the newer and more capable Mark 54 ASW torpedo (which will also be integrated on the RAAF's P-8 Poseidon maritime patrol aircraft) and the AN/AQS-22 airborne low-frequency dipping sonar.

Unmanned aerial systems can augment manned helicopters in the embarked aviation role. Small systems can provide additional airborne surveillance or communication relay capabilities, while larger aircraft bring the additional benefit of longer sortie times and ranges, allowing for greater persistence in over-the-horizon tasks than manned platforms. While unmanned systems aren't sophisticated enough to replace manned helicopters in combat roles, they offer considerable benefits in tedious tasks where persistence is the key, such as acting as communication relays or in wide area search activities. It's likely that the future frigates will carry a mix of manned and unmanned aircraft.

## Sealift and amphibious ships

Despite the substantial airlift capability provided by the RAAF's growing fleet of C-17 airlifters, in any meaningfully sized operation overseas the bulk of ADF personnel and materiel will be moved by sea. While airlift remains the fastest way to move small numbers of troops or small volumes of equipment, only sealift allows for large quantities to be moved efficiently. It's not surprising that one of the first questions asked by participants in war games and crisis exercises over the years has invariably been about the location and availability of sealift assets.

Given the nature of the task, sealift capability is improved primarily through additional capacity. Last decade, the 5,800-tonne HMAS *Tobruk* and the two 8,500-tonne amphibious vessels HMA Ships *Kanimbla* and *Manoora* constituted the ADF's sealift capability. The total capacity was approximately 1,000 troops and supporting vehicles, helicopters and landing craft. A single Canberra-class LHD will be able to embark a similar number of troops and a greater number of vehicles and have a greater capacity to carry stores. The LHDs also represent a quantum jump in amphibious aviation capability; each vessel can support up to 22 embarked helicopters operating from six deck spots, compared to half a dozen aircraft from two spots on their RAN predecessors. The helicopters will primarily support land forces, but can also include naval combat helicopters supporting task force ASuW, ASW or search and rescue roles.

They'll also provide a substantial amphibious lift capability. Amphibious lift is qualitatively different from general sealift, allowing personnel and materiel to be delivered to the shore without dedicated dock facilities (and from over the horizon, if need be). To coordinate such activities, the LHDs will carry integrated command and control elements. This capability allows the ADF to seabase headquarters staff, logistics and support elements, thereby reducing the footprint and protection requirement of forces deployed ashore.

## Afloat support

Afloat support vessels aren't glamorous but are an essential part of maintaining the fleet for extended deployments by providing fuel, food, stores and ammunition. Afloat support is currently provided by two vessels—HMA Ships *Sirius* and *Success*. Both ships are capable of underway replenishment of fuel to other ships during day or night. *Success* can also transfer ammunition, water and stores.

HMAS *Success* was commissioned in 1986 and is now nearing the end of its life. *Success* was given a major overhaul in 2013, during which time the Spanish Navy vessel *Cantabria* was lent to the RAN as a temporary replacement. HMAS *Sirius* is a converted commercial tanker that replaced HMAS *Westralia* in 2006. Despite some initial problems, *Sirius* has proven to be a workable low-cost solution. Both vessels will be replaced with two new-build afloat support ships, to be constructed in either South Korea or Spain.

The two-ship afloat support capability of the RAN is sufficient for a wide range of deployments, although two hulls provide limited ability for concurrency and sustainability over prolonged periods. If one ship were to be unexpectedly laid up for maintenance, the impact on fleet operations would be significant. If, as expected, the surface fleet expands in numbers and vessel size, that would strengthen the case for a third afloat vessel at some stage.

## Mine warfare

Mine detection and clearance is a vital naval function. Mines placed in shipping routes or near ports have the potential to completely disrupt Australia's sea trade. The Navy has six Huon-class minehunters, designed in Italy but built locally in a very successful project, the first of which was commissioned in 1999. These vessels have low magnetic signatures and are designed to have a high level of shock resistance. The Navy also has two highly capable clearance diving teams.

Two Huon vessels have been used intermittently for border protection security operations, and two have been placed in reserve since 2014, leaving only a small number of vessels available for their principal task. The net result is likely to be that the RAN's



minehunting capability is limited in both capacity and capability. While that's acceptable in low-threat environments (as was the case when the 2003 Defence Capability Review first recommended the mothballing of two of the then new Huon class), it represents a potential vulnerability in a more contested maritime space.

The 2009 Defence White Paper's proposed replacement for the Huon class was part of a 20-vessel offshore combatant vessel (OCV) class to be procured under project SEA 1180. These vessels would combine the functions of the Armidale patrol boats, the Huon minehunters and the Navy's hydrographic and oceanographic vessels. Given the unique signature requirements for minehunting vessels, it appears that the idea is for the OCV to deploy a specialised unmanned vessel for the task. The August 2015 announcement of a plan to bring forward a build of offshore patrol vessels mentioned a replacement for the Armidales, but provided no guidance about the fleet's other minor vessels. Presumably, more detail will become available when the shipbuilding plans are fleshed out.

### Patrol boats

The 14 Armidale-class patrol boats replaced the older Fremantle class from 2005 to 2008. Despite some teething problems with the fuel system, these boats have made a significant contribution to the civil surveillance program under the tasking of Border Protection Command and later the Australian Border Force—to the point that they've done little else for long periods. When not tasked for border protection, they also have a role in lower level regional operations and in the protection of our offshore oil and gas platforms against non-state threats.

The border protection job has been hard on the Armidales. The task requires a nearly constant presence at times, meaning that much of the fleet is transiting or patrolling and regular maintenance schedules are hard to meet. As well, responses are sometimes required in emergencies in demanding environmental conditions, leading to structural problems that take time to rectify. One Armidale-class vessel, HMAS *Bundaberg*, was extensively damaged by fire in 2014 while in contractors' hands during maintenance and has now been decommissioned.

The Armidales were also to be replaced by the OCVs under SEA 1180, as conceived in the 2009 Defence White Paper. Experience with the Armidales suggests that a larger vessel with better seakeeping and greater endurance makes sense.

### Hydrographic ships

For operations in coastal waters, knowledge of the topography of the sea floor is a critical requirement. The depth and texture of the bottom have a marked effect on sonar effectiveness, in turn affecting ASW or mine detection operations. The areas of Australia's responsibility are huge, covering more than one-tenth of the Earth's surface. Consequently, there are large areas where detailed and accurate information isn't available. The Navy operates two Leeuwin-class hydrographic survey vessels and four smaller survey motor launches (for operations in very shallow or constrained waters). Like the other minor vessels, the Leeuwin class is also slated to be replaced under SEA 1180. In this instance the business case is less clear, and a civilian contracted service would also seem to fit the bill.

## Appendix: Major force elements of the Royal Australian Navy

Role	Description	Current vessel types
Surface combatants	Long-range platforms that can sustain independent operations in remote areas for extended periods, including the escort of shipping and command and control of task groups	FFG: 4 Adelaide-class guided missile frigates
	Ability to perform anti-air, ASuW and ASW tasks	FFH: 8 Anzac-class frigates
	Ability to embark helicopters that extend the reach and tactical abilities of the ships	DDG: 3 Hobart-class guided missile destroyers (delivery from 2017)
Submarines	Maritime strike and interdiction, intelligence gathering, deployment of mines, clandestine deployment of special forces	SSG: 6 Collins-class guided missile capable submarines
Embarked helicopters	Maritime surveillance and reconnaissance, ASuW and ASW operations, search and rescue	16 Sikorsky S-70B-2 Seahawks (being phased out) 24 MH-60R Seahawks (in process of delivery) MRH-90 Taipans—drawn from a pool of 46 shared between the Navy and Army
Training helicopters	Lead-in training to prepare aircrew for embarked operations	A fleet of 15 training helicopters, including AS 350BA Squirrels and Bell 429s.
Amphibious lift	Troop and vehicle lift, helicopter transport and operations, deployment of landing craft, transport of materiel, medical evacuation	LHD: 2 Canberra-class amphibious assault ships (HMAS <i>Adelaide</i> to be delivered later in 2015) LSD: HMAS <i>Choules</i> , landing ship
Patrol boats	Patrol, surveillance and response capability Contribute to the civil surveillance program under tasking by the Australian Border Force	13 Armidale-class patrol boats
Afloat support	Refuelling and resupply for naval vessels and embarked helicopters while at sea, logistics support to land operations	AO: HMAS <i>Sirius</i> , 46,000-tonne auxiliary tanker AOR: HMAS <i>Success</i> , 17,900-tonne replenishment tanker
Minehunters	Detection and neutralisation of sea mines	6 Huon-class coastal minehunters (two in reserve) 2 clearance diving teams
Hydrographic survey vessels	Charting the sea floor to enable safe navigation and operations in shallow waters	2 Leeuwin-class hydrographic survey vessels 1 civilian-registered de Havilland Dash-8 200 airborne laser depth sounding aircraft

## Acronyms and abbreviations

ASW	antisubmarine warfare
AWD	air warfare destroyer
CEP	continuous evaluation process
LHD	landing helicopter dock
OCV	offshore combatant vessel
RAN	Royal Australian Navy
UUV	unmanned underwater vehicle

## Notes

- 1 The Japanese and South Koreans refer to 'AEGIS-equipped guided missile destroyers'.
- 2 Broadly speaking, the towed-array ASW sensor operates best at low speed, and ASW is best performed well ahead of any high-value units (HVUs, such as an LHD carrying a battalion group)—ASW vessels often 'sprint and drift' to keep ahead of HVUs. Air defence is best served by the AWD sailing in 'goalkeeper' mode parallel to the HVUs. Ideally, a task group would have both types of escort operating in tandem.
- 3 The FFGs can each embark two S-70B-2 Seahawks but regularly embark only one.

## Important disclaimer

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