

## **The Royal Australian Navy and its frigates**

Navies are sophisticated, complex and adaptable systems and frigates are one part of that system. The role frigates play depends on the purpose the navy is being employed to achieve; a purpose which is ultimately a national purpose. The frigate's role can therefore have both national strategic and operational and tactical elements.

From a national perspective, the future frigates will be required to perform the three enduring functions of a warship: warfighting, constabulary and diplomatic. Through these functions, they will be part of the Navy's contribution to Australia's demonstration of its national will and ability to play a role in the security and stability of our region and areas of strategic interest. By demonstrating significant capability they will assist to shape Australia's strategic environment as the Australian Government directs. For example, deployments of single ships and task groups to East Asia shows that Australia can send capable fighting ships to the area, underscoring the Australian Government's support for the security and stability of the region.

This paper explains what a frigate is, describes their history in Australian service and sets out the likely roles for the vessels to be delivered under the \$30 billion future frigate program.

### ***What is a frigate?***

While frigates have a long history as a type of warship, the term fell into disuse in the second half of the 19th century. The modern use dates from the Second World War, when it described a convoy escort vessel, primarily intended for oceanic anti-submarine warfare. Subsequent classes of frigates retained the anti-submarine specialisation to varying degrees, but have become more general-purpose in nature. In part this reflects the need for warships to have a range of capabilities to enable them to be effective (specialised vessels are usually not very useful outside their specific role and can be vulnerable if employed on their own) and, in part, it reflects the evolution of military technologies which have enabled a single vessel to be effective in different roles. In contemporary terms, a frigate is a general-purpose ocean-going vessel, optimised for anti-submarine warfare. Its size can vary widely depending on the area in which it is intended to operate, but the trend for larger hulls has been consistent, given the relatively small marginal cost for the size increase and the considerably greater military advantages which accrue.

A modern frigate must not only be understood from a hull-centric perspective, but also from a systems perspective, as a system in its own right and as part of broader systems such as task groups. Since the advent of the gyro-stabilised torpedo, navies have used increasingly sophisticated combined arms approaches to warfighting operations through different forms of task groups and so most warships, including frigates, must be able to contribute to a task group system.

### ***Frigates in the Australian Navy***

Australia has built or converted 32 frigates, spanning four generations of the type and with three different concepts for operational employment. The first generation were Second World War British River class designs, modified and built in Australia and intended for convoy escort duties, where the primary threat was from submarines. While their size and design limited their employment to specific roles, the Australian Navy retained some after the war and continued to operate them into and beyond the Korean War, where HMAS *Murchison* proved their use for inshore work: HMAS *Diamantina* served until 1980, modified as a hydrographic vessel.

The key limitation of the River class (and most first generation frigates) was their speed. While the relatively simple engineering plant was inexpensive to build, a top speed of around 20 knots limited their effectiveness against the high-speed submarines that started to emerge in 1945. Even more significantly for the Australian Navy, which was structured as primarily an anti-submarine force based around carrier task groups (responding to the assessed primary threat of Soviet submarines in Australia's area of strategic responsibility), the low speed meant they were not effective components of such a force.

The first of Australia's second generation of frigates were originally Q class destroyers, converted to frigates in Australia in the 1950s. These, along with the Type 12 frigates which followed in the 1960s, were capable of anti-submarine warfare as part of a task group, with modest air and surface warfare capabilities, enabling them to be used in a greater range of scenarios.

The third generation of Australian frigates were the *Oliver Hazard Perry* or, in Australian service, the *Adelaide* class. These vessels were also intended to operate primarily as part of a task group, but the improvements in their systems (combat data systems, communications links, helicopters and guided weapons) made them far more useful for much more than just anti-submarine warfare. While it had not been originally anticipated, the broader range of warfighting capabilities of the *Adelaide* class became very important to the Australian Navy's capability after the early 1980s decision to dispense with an aircraft carrier and disband fixed-wing naval aviation, and with it the ability to operate the task group as structured at that time. The Navy subsequently set out to redesign large parts of its tactical and operational capability, and ultimately strategic utility for Australia, based on surface assets no more capable than destroyers and frigates.<sup>1</sup>

The *Anzac* class frigates, acquired in the 1990s, are the fourth generation of Australian frigates and are the first for which Australia did not depend on a British or US design, being based on the German MEKO. They were also the first acquired after the 1987 White Paper, which set out the Defence of Australia construct. Intended as patrol frigates for operations around Australia, the vessels could operate independently, as part of surface ship task groups, and in conjunction with other Australian Defence Force capabilities. Subsequent modifications have greatly increased their offensive and defensive effectiveness in higher threat environments. While they retain an emphasis on anti-submarine warfare capabilities, their present fit out makes them a very capable general purpose frigate, reflecting the broad range of operational requirements to which Australia has and anticipates deploying them.

### ***Future frigates, fighting ships ...***

The vessels to be delivered under the Australian Navy's future frigate program will be the Navy's fifth generation frigate. They will be delivered as part of the new continuous shipbuilding process under the national shipbuilding plan. That initiative marks the maturity of the Navy as a national enterprise. That is significant in a capability sense, as modern fighting ships are part of interdependent systems that includes people and organisations in private industry as well as the Australian Defence Force. The ability to adapt and evolve the systems in the future frigate, to enable them to be operationally effective will be much greater with access to the depth of understanding that comes from owning the vessels from the initial design onwards.

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<sup>1</sup> It is outside the scope of this paper, but the greater recognition of and resources available for submarine and mine warfare are also significant – the characterisation of the Australian Navy as a destroyer and frigate navy underplays the importance of the submarine and mine warfare disciplines.

The future frigates will have a range of warfare capabilities, including surface and air warfare, so they can be employed on independent operations and also contribute to a task group, but their primary purpose will be anti-submarine warfare. While the design for the first batch of vessels has not yet been settled, specific anti-submarine warfare capabilities will include various sonar systems (possibly including some form of towed array) and aviation facilities for one or two Seahawk Romeo helicopters. Unmanned (and, in the future, autonomous) vehicles operating in the air and above and below the water are becoming more important; the extent to which they are incorporated into the baseline configuration for the first batch of vessels is not yet clear, but the capability to operate Unmanned Aerial Systems (UAS) is highly likely, as is the provision for support for and integration with a wider range of autonomous systems as they are introduced into service.

Given the growing number and capability of the submarines operating in Australia's area of strategic interest, the emphasis on anti-submarine warfare capabilities (both independently and as part of a task group) is likely to be as clearly pronounced as in any frigate the Australian Navy has operated.

Fighting ships have traditionally been characterised by the number and size of hard-kill weapon systems they carry and while it remains a necessary description, it is no longer sufficient to define capability. The cyber warfare capability of future fighting ships is one of the most obvious examples. The extent and nature of cyber warfare capabilities in a future frigate are likely to evolve throughout its service life. The ships will have to be able to provide both stand-alone and connected capabilities. Perhaps even more than the profusion of autonomous systems, cyber capabilities will evolve the way in which the future frigate might operate as a fighting ship; cyber warfare will certainly emphasise the need to integrate across Australian Defence capabilities and with allies.

The most demanding role likely to be required of a future frigate is its warfighting function as part of an Australian task group, operating in a contested environment against a capable opponent, requiring multiple concurrent activities, such as theatre anti-submarine warfare, information warfare, integrated air defence and amphibious operations. While the composition of such a task group could vary widely, one likely grouping is a *Canberra* class amphibious ship (LHD), a replenishment vessel (AOR), a *Hobart* class guided missile destroyer (DDG) and two future frigates. Such a task group might have a dozen or more helicopters embarked on a number of different vessels (Seahawk Romeos and MRH-90 transport helicopters) as well as unmanned aircraft, and be supported by a *Collins* class submarine and Air Force air combat and maritime patrol aircraft, as well as remote land-based sensor and intelligence systems. For amphibious operations there would also be land forces embarked on the LHD.

In such a significant task group, the future frigate's anti-submarine role would likely be emphasised, both using its own sensors and coordinating the operations of embarked and supporting assets. The future frigate would also be expected to be able to contribute to surface warfare functions, individually or as part of a surface action group to attack enemy surface formations, and also be able to conduct maritime strike on targets ashore and naval gunfire support of land forces. While unlikely to have air warfare capabilities as significant as the DDGs—though that is by no means impossible given the size and radar fit mandated for the vessels—a future frigate would be expected to be able to contribute to the air surveillance task (it will have a version of the Australian CEA radar), be able to defend itself against attack by aircraft and missiles, and also be able to act as a 'goalkeeper' or close-in escort for high value units such as the LHD and AOR against such threats from the air.

An Australian future frigate will also be expected to be able to play a similar role as part of a combined task group when operating with American or other coalition forces. These task groups could vary in size and capability from USN carrier battle or amphibious response groups, to ones

including patrol craft from Pacific Island nations. As part of a USN carrier battle group, the future frigate would be playing a screen role focussed on anti-submarine warfare, similar to that for an Australian task group. By contrast, when operating with smaller, less capable vessels from Pacific Island nations, a future frigate would be expected to be able to command the operations of the task group and act decisively across air, surface and sub-surface domains. This diverse range of requirements highlights the need for features that are not always highlighted, such as communications systems that are interoperable not only with Australian assets, but those of allied and partner nations. While often not making the headlines, the ability to be an effective part of a networked, integrated force will be fundamental for the future frigate.

The future frigate will also be expected to contribute to smaller task units, such as surface action groups, usually formed from a larger task group for a short, defined task. Such tasks are often offensive in nature, being intended to maintain initiative, and require agility and lethal force. A typical surface action group is made up of a destroyer and a frigate, which together can operate effectively in high threat environments and be expected to successfully find, identify and attack a range of targets using embarked aircraft, UASs, guided weapons or guns, and to do so utilising supporting assets such as air force aircraft.

Finally, a future frigate will also be expected to be able to operate as an independent vessel. In some cases that could involve warfighting tasks, though this is not usually desirable, particularly in high threat environments where a task group is likely to be a more effective fighting unit. However, for constabulary and diplomatic functions, a future frigate will be required to be an effective solo asset. The ways in which Australia has employed its frigates over the last quarter of a century are a good guide to the type of tasks required of the future frigates in the constabulary and diplomatic roles: maritime security patrols.

### ***In case of trouble, send a frigate ...***

Fortunately, Australia's frigates have been called on to conduct or have been prepared for relatively few warfighting operations in recent decades: the 1991 and 2003 Gulf Wars and East Timor. By contrast, there's a constant demand for constabulary and diplomatic operations, ranging from counter-narcotics operations in the Caribbean and arresting illegal foreign fishing vessels in Australia's Southern Ocean exclusive economic zones off Heard and MacDonal Islands, to search and rescue operations throughout Australia's area of responsibility. In a diplomatic context, Australia's frigates have visited allies, neighbours and partners throughout Asia, the Middle East and occasionally to Europe, Africa and the Americas. The consistent theme is that a frigate is (and must be) effective in situations where the circumstances are difficult enough that no other arm of government can operate.

Australia's most enduring maritime security commitment has been patrols in the Red Sea, Arabian Gulf, Gulf of Aden and North East Indian Ocean. Since 1990, Australia's frigates have been part of United Nations efforts to enforce sanctions against Iraq, anti-piracy operations to protect international maritime trade and, more recently, counter-narcotic operations targeting terrorist funding networks. These deployments have routinely been six months or more in duration. To sustain the Australian commitment to have a frigate continuously on station for the majority of the past two decades, between three and four frigates have been required at various stages of maintenance, training and deployment. The future frigate will need to be able to participate in this or similar operations: to maximise the time available for operational output, the future frigate will need to be as efficiently maintained and upgraded as possible, using modern asset management approaches. Similarly efficient training systems will also be essential. Keeping the future frigate

combat ready will also require enduring integration with the national naval enterprise to enable rapid incorporation of technological improvements.

The current frigates have also been involved in maritime security operations around Australia's maritime approaches. While patrol boats and, in future, the offshore patrol vessels will remain the mainstay of this work, a future frigate will still need to be able to conduct them, particularly when the operations need to be sustained over longer periods of time. That underscores the need for the future frigate to have a high level of endurance (which is also critical for sustained high-intensity operations). That will be achieved by designing in and providing for a combination of steaming range, consumable stores such as food, and sufficient crew to operate effectively in demanding circumstances over extended periods.

The larger hull planned for the future frigate by comparison with its predecessors will make it possible to have a wider operational envelope, particularly for air operations, which will also confer improved warfighting capabilities. The generally improved sea keeping of a larger vessel will also allow it to operate in the Southern Ocean if required.

The search and rescue operations in the Southern Ocean (HMAS *Darwin* in 1994/5, HMAS *Adelaide* in 1997, HMA Ships *Perth* and *Toowoomba* in 2014) and the patrols for illegal foreign fishing vessels in the exclusive economic zone off Heard and MacDonal Island (HMAS *Anzac* in 1997 and HMAS *Canberra* in 2002) are further examples of the operations Australia's frigates have undertaken. At the time, the frigate was the only option available to the Australian Government that combined the availability, endurance, speed, capacity to use calibrated levels of force and the seakeeping ability to operate in and project power into some of the roughest oceans in the world. While large civil patrol vessels are now available in the Australian Border Force, they lack significant warfighting capabilities, so a future frigate will still be required to have the ability to be safe and effective in rough conditions to provide government with the full range of surface response options.

Frigates have also been used when diplomatic initiatives needed to be conducted in a safe, neutral environment. In that context, HMA Ships *Sydney* and *Newcastle* contributed to the peace negotiations in the Solomon Islands in 2000, providing a sovereign Australian venue proximate to another country. And the imposing physical appearance of the future frigate will contribute to its utility by bringing a gravitas to the setting.) Innovative and imaginative use of spaces (flight decks, hangers and cafeterias) allows a frigate to be an effective agent of the Australian Government's diplomatic engagement. It also enables a frigate to contribute to humanitarian and disaster relief, as HMAS *Darwin* did in 2016 after New Zealand's Kaikoura earthquake and HMAS *Swan* in the Philippines in 1991.

When the program is finished the future frigate will be the most numerous large Australian warship and so is likely to be involved in every type of maritime operation Australia undertakes, from warfighting in an Australian or Coalition task group, to independent maritime security operations and diplomatic visits. While the basic design will be focussed on the core task of anti-submarine warfare, it will require capability across warfare disciplines and the full spectrum of operations to be able to conduct the range of work Australia requires its Navy to undertake.