POLICY ANALYSIS ASPI

Navy capability review 2010

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29 June 2010

ASPI AUSTRALIAN STRATEGIC POLICY INSTITUTE

This paper provides an overview of the capability of the Royal Australian Navy (RAN) and is an update of a 2008 ASPI paper. Other papers in the 2010 series will update the corresponding reports on Army, RAAF and C⁴ISR capabilities.

This update at a glance – Navy capability since 2008

The RAN is a middle power naval force that relies on frigates as its main surface combatants and *Collins* class submarines for its underwater arm. Significant changes to the RAN's capabilities since ASPI's 2008 review are shown in Table 1.

Table 1: Significant capability changes since 2008

Capability	Change	Comments
Surface combatants	↑	Completion of the FFG upgrade and progress in the *Anzac* frigate anti-ship missile defence program have boosted the short to medium-range air defence capability of the fleet. Long-range air defence capability will be delivered with the 'air warfare destroyers'* from around 2014.
Submarines	↓	Availability problems and manning shortfalls have seen the submarine arm fall well short of the expected number of sea days and crew expertise decline.
Naval aviation	↓	The availability of specialist parts has made the *Seahawk* fleet increasingly difficult to support. A significant boost in airborne capability will occur with delivery of new helicopters around 2014.
Anti-submarine warfare	↓	The progressive decline in the embarked helicopter capability and reduced *Collins* submarine availability for training has seen overall ASW capability continue to weaken. A program to fit new ASW torpedoes to the *Seahawk* helicopters has been abandoned.

* The project name for the vessels is Air Warfare Destroyer (AWD). They are properly designated as guided missile destroyers (DDGs)—which is the description used subsequently in this paper.

The Defence White Paper

The additional and generally larger vessels announced in the 2009 Defence White Paper (see Table 2) will, when eventually delivered, increase the capability of the Navy in a number of areas, and will ensure that Australia

remains at the forefront of middle power navies in the region. It will not, however, significantly change Australia's naval capability relative to the larger Asian powers.

Table 2: Naval initiatives in the 2009 Defence White Paper

Project	Number	Comments
Guided missile destroyers	3	Confirmation of existing project. Option retained for a fourth, pending strategic assessments.
Amphibious ships	2	Confirmation of existing project.
Future submarines	12+	New-build submarines, doubles size of existing fleet..
Future ASW frigate	8	Will replace the *Anzac* class frigates with larger vessels, with delivery beyond 2019.
Multi-role offshore combat vessel	20	To replace patrol boats, hydrographic ships and coastal minehunters with common hulls and modular equipment fits. Estimated to be 2,000 tonnes, for delivery beyond 2019.
Sea Logistic Support and Replenishment Support Capability	1	Replacement for HMAS *Success* 'at the end of next decade'.
Naval combat helicopters	24+	Will replace the SH-60B *Seahawk* (and the cancelled *Super Seasprite*) as the embarked combat helicopter for the fleet.
Maritime land attack cruise missile		For future submarines and frigates as a strategic strike option.
SM-6 long-range air defence missile		For DDGs, providing long-range air defence capability.
Co-operative engagement capability		For DDGs, allowing them to exchange targeting data with other platforms, including *Wedgetail* AEW&C aircraft.

Capability overview

The Royal Australian Navy (RAN) operates a fleet comprised of surface combatants, submarines, amphibious assault vessels, patrol boats and support vessels as well as a range of helicopters (see Table 3). In size it is a little larger than the navies of countries like Singapore and Thailand, but is much smaller than those of China, India and Japan. The additional and generally larger vessels announced in the 2009 Defence White Paper will, when eventually delivered, increase the capability of the Navy in a number of areas, but will not significantly change Australia's naval capability relative to the larger Asian powers.

In terms of capability, the RAN is currently 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 (and the other elements of a carrier battle group required for escort) in the fleet circumscribes the range of operations the ADF can undertake. The principal operator of carriers, the United States Navy, can project air power and provide air cover for naval and land based operations in hotly disputed areas; capabilities not found in the force structures of other nations. The only other carrier operators in the Asia Pacific are the aspiring major powers Russia and India, with China recently confirming that it has aspirations to field an aircraft carrier capability. Russia operates a single carrier, providing limited naval air power. India operates an ex-Royal Navy carrier and is in the process of acquiring another from Russia, as well as beginning to build its own indigenous design. However, aircraft carriers are extremely expensive to acquire and operate, and there is little prospect of Australia deciding to once again field a carrier.

Of the other navies, Japan and South Korea currently operate guided missile destroyers (DDGs)[1], a capability that the RAN will only take delivery of in the middle of the decade. The amphibious ship acquisition, announced at the same time as the DDG decision, will put the RAN in the first rank of regional amphibious capability.

While this paper focuses on the Navy, it is important to note that, in many instances, naval elements combine with other services to provide a joint ADF capability. For example, the RAAF contributes to anti-submarine warfare (ASW) through its AP-3C *Orion* patrol aircraft and to fleet air defence through its air combat capability. And the amphibious ships will enable joint operations with the Army (and probably the RAAF).

Capability shortfalls

Current capability shortfalls include the low availability of *Collins* class submarines, although recent developments offer some hope of improvement in the short to medium term. The overall capability to conduct ASW remains poor, owing largely to deficiencies in ship-borne sensors and airborne sensors and weapons. System improvements across the fleet will help improve ASW, but the White Paper's ASW-optimised future frigates are at least a decade away. As regional states expand and/or improve their submarines fleets,[2] Australia's naval forces will be operating in an environment where sophisticated diesel-electric and nuclear submarines are increasingly the norm.

The fleet of SH-60B *Seahawk* embarked helicopters is nearing the end of its service life, with a replacement—due for delivery by 2014—identified as 'urgent' in the 2009 White Paper. The air defence capability of the surface fleet has improved since ASPI's 2008 capability summary due to the completion of the FFG frigate upgrade. Further improvements may be made in the next few years with the *Anzac* class in the process of being fitted with a phased-array radar system and related systems. However, true long-range fleet air defence will be delivered only when the *Hobart* class guided missile destroyers are delivered around 2015.

Table 3: Major vessels of the Royal Australian Navy

Role	Description	Current vessel type(s)
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. Ability to perform anti-air, anti-surface and anti-submarine tasks. Ability to embark helicopters that extend the reach and tactical abilities of the ships.	FFG: *Adelaide* class guided missile frigates (4). FFH: *Anzac* class frigates (8). DDG: *Hobart* class guided missile destroyers (3 firm +1 option, for delivery from 2014).
Submarines	Maritime strike and interdiction, intelligence gathering, deploying mines, clandestine deployment of special forces.	SSG: *Collins* class guided missile capable submarines. (6).
Embarked helicopters	Maritime surveillance and reconnaissance, anti-surface and anti-submarine operations, search and rescue.	Sikorsky *Seahawk (16)* Westland *Sea King* (6) – to be retired in 2010 and replaced by MRH-90s.
Amphibious lift	Troop and vehicle lift, helicopter transport and operations, deployment of landing craft, transport of materiel and medical evacuation.	LPA: *Kanimbla* class amphibious landing ship (2). LSH: HMAS *Tobruk* heavy landing ship. LHD: Two *Canberra* class 27,000 tonne amphibious vessels from 2013.
Patrol boats	Patrol, surveillance and response capability. Contributes to the civil surveillance program under tasking from Border Protection Command.	*Armidale* class patrol boats (14).
Afloat support	Refuelling and resupply for naval vessels and embarked helicopters while at sea and provides logistics support to land operations.	AO: HMAS *Sirius*, 46,000 tonne auxilliary tanker. AOR: HMAS *Success*, 17,900 tonne replenishment tanker.
Minehunters	Detection and neutralisation of sea mines	Six *Huon* class coastal minehunters. Two clearance diving teams.
Hydrographic survey vessels	Charting the sea floor to enable safe navigation and operations in shallow waters.	Two *Leeuwin* class hydrographic survey vessels. One civilian-registered Fokker F.27 airborne laser depth sounding aircraft.

Issues and future decisions

Major considerations over the next few years will include:

- identifying platform solutions and planning the acquisition of the naval capabilities announced in the White Paper: future submarines and frigates, modular offshore combatants and helicopters
- selection of either the Lockheed Sikorsky SH-60R or the NATO Helicopter Industries NFH-90 as the future embarked helicopter (decision expected early 2011)
- acquisition of land attack cruise missiles and long-range SM-6 surface-to-air missiles
- further trials and possible deployment of the CEAFAR radar for the *Anzac* frigates

- development of the joint concepts and expertise required for amphibious operations
- development of joint doctrine and operating procedures for cooperative engagement between surface vessels and the *Wedgetail* airborne early warning and control aircraft
- managing the workforce required to operate current and soon to be delivered capabilities.

Capability summary

Surface combatants

Surface combatants represent Navy's largest investment. They fulfil a wide variety of roles, including high-end warfighting, protection of sea lanes, and escort of shipping and interdiction tasks such as the Proliferation Security Initiative. Surface combatants can operate far from base and maintain a persistent presence. Australian surface combatants have operated in the Persian Gulf area almost continuously since 1990—including both Gulf Wars—and operations continue 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.

The Navy's surface combatant force is in transition. The fleet suffered a significant reduction in its area air defence capability early this decade with the retirement of the guided missile destroyers (DDGs). The surface combatant fleet currently comprises two classes of frigates, the air defence capability of which has recently been improved. An earlier plan to upgrade the *Anzac* class frigates into a capable air defence platform was abandoned, although recent upgrades of the surface-to-air missile and targeting systems have provided a self- and point-defence capability. In future the *Anzacs* may receive a further upgrade in the form of CEA's CEAFAR phased-array radar, which will improve the ability to track and engage multiple targets. A much-delayed upgrade to the guided missile frigates (FFGs) under Project SEA 1390 has finally been completed. The ability of the fleet to defend itself against low to medium-level air threats has been boosted considerably by the recent upgrades, but the ability to operate in a high-threat environment will await the delivery of a dedicated guided missile destroyer.

The surface fleet will receive a major capability boost when the *Hobart* class DDGs are delivered. Three vessels are currently in the construction pipeline, and the White Paper has left open the possibility of a fourth. They will provide the fleet with additional area air defence and situational awareness capability. Against low to medium air threats they will enhance the operating envelope of the AEW&C and Maritime Patrol Aircraft (see the Air Force Capability Summary in this series) as they can be protected by the DDG without the need for dedicated fighter escort. The White Paper also flagged the fitting of a co-operative engagement capability (CEC) that will allow the DDGs to exchange targeting data with AEW&C aircraft, enabling the DDG to engage targets with the 375 km range Standard Missile SM-6 missile, well beyond the ship's radar horizon. The DDGs are scheduled for delivery from 2014, although full capability including the CEC and SM-6 will be some time later.

Anti-submarine warfare (ASW) is a continuing major capability shortfall. The *Collins* class submarine is a capable ASW platform but is limited by its diesel-electric propulsion. Consequently, it is most effective in littoral areas and bottlenecks where geography constrains the movements of adversary forces. In the open ocean, the fleet's organic ASW capability must be provided by surface vessels and their embarked helicopters, both of which fall short of what is required to operate against modern submarines. Current surface combatant system shortfalls include the

absence of low-medium frequency hull-mounted sonars and the lack of a variable depth sonar capability. Defence has recognised these shortfalls and has produced an ASW roadmap. The ASW sensor fit for the DDGs (announced in 2008) will provide more capability than the current surface combatants have. However, the DDGs air defence role will constrain its ability to conduct effective ASW operations simultaneously.[3] True rectification of this capability gap is the target for the White Paper's future frigate project, which will replace the *Anzac* class. Ideally the future frigates will be able to embark two helicopters (the current surface combatants and DDGs carry only one) as well as having a suite of onboard sensor and weapons systems.

The low capability and availability of embarked helicopters also adversely affects the ability of the surface fleet to locate and strike ships or other surface targets (anti-surface warfare – ASuW) or to locate and engage submerged submarines (see the entry for naval aviation below). Either of the helicopters under consideration for the *Seahawk* replacement from 2014 will provide a major boost in capability, with the two types offering different strengths and weaknesses.

Submarines

Ten years ago the RAN's *Oberon* class submarines were approaching the end of their service lives. (In fact, two of them were taken beyond their planned retirement dates because of slippages in the *Collins* project.) The 'O-boats' were very capable submarines in their day, but the *Collins* boats are much larger (by almost 1,000 tonnes) and were designed from the start for a more wide-ranging role, being able to remain at sea for longer periods. The high-level requirement for the *Collins* class was for two boats to be on patrol at 2,500 nautical miles from base and to be 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 North Asia. Potential adversaries cannot assume that their homeports and coastal waters are safe refuges.

Now that they have been fitted with fully-functional combat systems, the *Collins* class boats are capable conventional submarines that are highly regarded by allied nations, who have experienced great difficulty when facing them in exercises. Their submerged dash speed and endurance is superior to the *Oberon*. The *Collins* can stay at sea for longer with greater ability to remain submerged than comparable diesel submarines, although the lack of an air independent propulsion (AIP) system means that some modern submarines can maintain longer submerged times, albeit at very low speeds. The *Collins* boats are now credible ASuW platforms, armed with wire-guided torpedoes and *Harpoon* anti-ship missiles.

Being a conventional diesel powered submarine, the *Collins* fleet cannot match the speed of surface vessels during a transit, and so cannot provide ASW escort for a transiting task group. Instead, submarines would be dispatched in advance of a task group to take up patrol in areas where operations—such as amphibious lodgement—will be conducted.

The capacity of the *Collins* fleet for concurrent tasking is limited by its size and in recent years by very poor levels of availability. The aim is to have two boats available at short notice, two more available for rotation at longer notice and two in deep maintenance. Even if this were to be achieved, sustained simultaneous deployments, especially for contingencies that occur far afield, would leave little in reserve for other tasking. Lately, however, only two (and possibly only one on occasion) have been available for tasking. Mismanagement and/or underperformance of the maintenance program, mechanical problems and manning shortages have all contributed to the underperformance of the submarine arm.

Over the lifetime of the current DCP, *Collins* boats are planned to receive progressive upgrades to their sensors and other systems to keep them near the forefront of conventional submarine capability. However, developments by other submarine manufacturers will erode the qualitative advantage of the *Collins* boats over time, which will be most significant in submarine versus submarine operations. Features such as AIP and remotely controlled submersibles will become increasingly important for submarine operations and both are expected to be high on the priority list for the White Paper's future submarine.

Naval aviation

Embarked helicopters are important system components of naval surface units. In warfighting roles, they greatly extend the reach of ships' weapons and sensors, enabling 'over the horizon' search and strike missions. They can conduct ASuW and ASW missions with missiles and torpedoes, as well as search and rescue activities. Current embarkable helicopters include sixteen Sikorsky S-70B-2 *Seahawks* and six Westland SK-50 A/B *Sea Kings*, the latter in the process of being replaced by the same number of MRH-90 multi-purpose helicopters.

Naval aviation remains an area where capability is well below state of the art. The failure of the *Super Seasprite* project has compounded the problem. The current fleet of helicopters suitable for embarked operations is limited in numbers, availability and capability. Navy has indicated that parts availability of the ageing *Seahawks* is becoming problematic. This increases the difficulty—and probably the expense—of keeping the fleet flying. But the most serious problem from a capability perspective is the lack of warfighting systems. None of the current embarked helicopters carry an anti-ship missile for ASuW, although they can provide targeting data for ship-launched *Harpoon* missiles. In the ASW role, the fleet is without a dipping sonar for submarine detection, and the Mk 46 airborne torpedo carried by the helicopters is obsolete.

With these shortfalls in mind, the White Paper identified naval aviation as a priority area and brought forward the acquisition of a replacement for the *Seahawk.* As a consequence, neither the originally-planned *Seahawk* midlife upgrade or the more recent (and more modest) *Seahawk* Capability Assurance Program will go ahead. Although the replacement type is expected to be delivered from 2014, full operating capability will not be achieved for some time after that and Navy's embarked helicopter capability will remain below modern standards for the first half of this decade. ASPI will produce a discussion paper on the future naval helicopter decision later in 2010.[4]

Sealift and amphibious ships

For any meaningfully-sized operation overseas, the bulk of ADF personnel and materiel would necessarily be moved by sea. Airlift remains the fastest way to move small numbers of troops or small volumes of equipment, but only sealift allows for large quantities to be moved efficiently. It is not surprising that one of the first questions asked by participants in war game and crisis exercises over the years has invariably been about the location and availability of sealift assets.

Sealift is improved primarily through additional capacity (although their contribution to command and control and other operational tasks is certainly welcome.) As such, the ADF capability has improved markedly over the last decade, and will improve further over the next.

A decade ago, the 5,800 tonne HMAS *Tobruk* was the primary sealift asset of the RAN. Since then it has been augmented by two 8,500 tonne LPAs (Landing Platform Amphibious), HMAS *Kanimbla* and *Manoora*. These ships were procured from the United States Navy and modified as helicopter-capable amphibious

transports for the RAN. Each of these vessels can transport 350–520 troops and supporting vehicles, helicopters and landing craft, and carry medical facilities with forty beds.

In the future, the RAN's sealift capability will receive a substantial boost when two 27,000+ tonne amphibious *Canberra* class Landing Helicopter Docks (LHDs) are delivered. It is important to note that amphibious lift is qualitatively different to general sealift. Amphibious ships are designed to allow personnel and materiel to be delivered to the shore without dedicated dock facilities (and from over the horizon if need be.) Each *Canberra* class ship will be able to embark 1,100 personnel with vehicles and landing craft.[5] Like the LPAs, the amphibious ships will be able to carry command and control elements. In terms of embarked aviation, the LHDs are a quantum change in capability, as each ship will be able to support up to a dozen embarked helicopters operating from six deck spots. There are no plans to operate naval combat helicopters from the LHD decks; the embarked helicopters will primarily serve land forces. But the value of having additional ASW or ASuW helicopters in a task force is likely to see this issue revisited.

As the RAN has retained the ski-ramp configuration the Spanish Navy requires for use with its current short take-off vertical landing (STOVL) *Harriers* and, in the future, JSF aircraft, these ships offer considerable versatility to the ADF. This may include the launching of larger fixed-wing unmanned aerial vehicles or even short take-off vertical landing fast jets.[5] The command and control systems and facilities on the LHDs will enable the ADF to seabase headquarters staff, logistics and support elements, thereby reducing the footprint and protection requirement of forces deployed ashore.

The current fleet of three vessels offers more options in terms of simultaneous deployments in different locations or larger deployments to a single location than was possible in the past. A question that is sometimes asked is whether a focus on a smaller number of large ships instead of a larger number of smaller ones is correct. A larger fleet would provide better concurrency for simultaneous deployments to different locations (for example, Timor, Solomon Islands and Fiji), but would also bring with it greater fixed costs in terms of crew numbers and possibly running costs. And large deployments to one location would require the movement of multiple vessels. There is no simple answer to this question—it is always dependent upon specific operational circumstances.

To supplement the amphibious capability, the White Paper includes plans for the acquisition of a large strategic sealift ship of between 10,000 to 15,000 tonnes to move stores, equipment and personnel. The vessel is not intended to deliver the initial amphibious lodgement and is intended to provide ongoing sustainment support for deployed forces, allowing the LHD ships to remain in areas of operations in direct support of the land force ashore. It will be able to land vehicles and other cargo without requiring port infrastructure. And it will also allow some extra concurrency should simultaneous deployments be required.

Afloat support

Afloat support vessels are not glamorous, but they are an essential part of maintaining the fleet for extended deployments. Afloat support is currently provided by two vessels: HMA ships *Sirius* and *Success*. Both are capable of underway replenishment of other ships, including transfer of fuel, ammunition, water and stores during day or night.

HMAS *Sirius* is a converted commercial tanker that replaced the HMAS *Westralia* in 2006. The afloat support capability of the RAN is now sufficient for a wide range of deployments, though two hulls provide limited ability for concurrency and sustainability over prolonged periods. Although very successful by the broadest

project management metrics—schedule and budget—the capability delivered by the *Sirius* has received a mixed report card. It does not use the same fuel as the rest of the surface fleet, and so has to carry a different stock for its own use. As well, commercial tankers are designed to sail either full or empty, not with a partial fill, and there are some sea-keeping problems as a result. The White Paper initiatives include replacement of HMAS *Success* with a new ship that will enter service at the end of the next decade. In the light of the *Sirius* experience, it is not clear that the same converted-COTS approach will be taken.

Mine warfare

Mine detection and clearance is a vital function. Mines placed in shipping routes or near ports have the potential to completely disrupt Australia's sea trade. Navy has six *Huon* class minehunters, designed in Italy but built locally in a very successful project. The first of class was commissioned in 1999. These vessels have low magnetic signatures and are designed to have a high level of shock resistance. Moreover, two *Huon* ships have been used for border protection security operations rather than minehunting since 2008. Navy also has two highly capable mine clearance diving teams.

The White Paper's proposed replacement for the *Huon* class is included in the proposed twenty vessel Offshore Combatant Vessel (OCV) class. With rationalisation of the fleet in mind, these vessels would combine the functions of the *Armidale* patrol boats, *Huon* mine hunters, and the hydrographic and oceanographic vessels. Given the unique signature requirements for mine hunting vessels, it appears that the concept is for the OCV to deploy a specialised unmanned vessel for the task.

Patrol boats

In recent years, fourteen new-build *Armidale* class patrol boats have replaced the older *Fremantle* class. Despite some teething problems with the fuel system, these boats make a significant contribution to the civil surveillance program under the tasking of Border Protection Command. They also have a role for lower level regional operations and in the protection of our offshore oil and gas platforms against non state-based threats (the reason given by the previous government for ordering two additional boats).

In the White Paper's Force 2030, the *Armidales* will also be replaced by the OCVs. Again, there are questions about the operating concept. At up to 2,000 tonnes, it is difficult to see how routine constabulary duties against small fishing or people smuggling vessels could be conducted safely. Presumably a deployable smaller vessel of some sort is envisaged.

Hydrographic ships

For operations in coastal waters, knowledge of the topography of the sea floor is a critical information requirement. The depth and texture of the bottom has a marked effect on sonar effectiveness, in turn affecting ASW or mine detection operations. The areas of Australia's responsibility are huge—almost one eighth of the Earth's surface. Consequently, there are large areas where detailed and accurate information is not available. Navy operates two *Leeuwin* class hydrographic survey vessels and four smaller survey motor launches (for operations in very shallow or constrained waters).

The *Leeuwin* class is also slated to be replaced by OCVs. For oceanographic and hydrographic tasks, the OCV will deploy an unmanned vessel, allowing operations in shallow waters.

Endnotes

1 ASPI has detailed regional submarine plans in the *Special Report* **'**The enemy below: Anti-submarine warfare in the ADF' available at http://www.aspi.org.au/publications/publication_details.aspx?ContentID=116.

2 Broadly speaking, the towed-array ASW sensor operates best at low speed and ASW is best performed well ahead of high value units (HVUs) such as LHDs carrying embarked forces. For that reason, ASW vessels often 'sprint and drift' to keep ahead of the HVU(s). However, DDGs are most effective in the air defence role when sailing in 'goalkeeper' mode, parallel to the HVUs. Ideally a task group would have both types of escort operating in tandem.

3 The background to this decision and the merits of the competing types are discussed in two previous ASPI publications: *Rational to rationalise? Australia's future naval combat helicopters revisited*, September 2009, available at http://www.aspi.org.au/publications/publication_details.aspx?ContentID=224&pubtype=9 and *Australian naval combat helicopters-the future*, February 2009, available at http://www.aspi.org.au/publications/publication_details.aspx?ContentID=200&pubtype=10

4 According to Army, each ship will carry 1,100 personnel. Of those, approximately 500–700 will be combat troops out of a hardened and networked Army Battle Group (HNA BG), which will consist of 2,200 people. If both ships were available for an operation (a questionable assumption), they could embark only two thirds of an HNA BG.

5 This would be a far from trivial exercise—the mix of fixed and rotary wing assets on a relatively small deck would be difficult and potentially dangerous.

About the Author

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The author would like to acknowledge the efforts of the Department of Defence and the ADF in reviewing a draft of this paper. Their contribution is gratefully acknowledged but all judgements in this paper and any errors or omissions remain the sole responsibility of the author.

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