



Nuclear-Powered Submarines for Australia: Origin Stories



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- to promote understanding of sea power and its application to the security of Australia's national interests
- to contribute to regional engagement and the development of maritime strategic concepts
- to facilitate informed discussion on matters of maritime security and strategic affairs

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Cover image

United States Navy Los Angeles class nuclear-powered submarine USS Key West on deployment in the Western Pacific. United States Navy Los Angeles class nuclear-powered submarine USS Key West on deployment in the Western Pacific.

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The announcement in 2021 that Australia would acquire nuclear-powered submarines for the Royal Australian Navy (RAN) signalled a significant shift in Australia's defence policy. For many it seemed as if it was a decision and discussion without precedent, but this is not the case. The question of whether Australia should acquire nuclear-powered submarines was first asked in 1959 during the simpler discussion of whether Australia should acquire submarines at all. Over the years that followed the nuclear propulsion question was raised several times, including in 1965 as the construction program for the RAN's first four *Oberon* class submarines was well underway in the UK.

This paper will explore these early discussions in Australia about the potential for nuclear propulsion for RAN submarines. This will show how the nuclear propulsion question is far from new and that Australia long ago considered whether the RAN should acquire nuclear-powered submarines.¹ This issue is seemingly divorced entirely from questions of whether or not Australia should pursue a civil nuclear industry or obtain nuclear weapons.² In light of the recent AUKUS discussion, it is important to realise the historical background behind nuclear propulsion in the RAN and to highlight that the question has been asked

¹ The term 'nuclear submarine' is here used to refer to a submarine with nuclear propulsion. It does not indicate a submarine armed with nuclear weapons.

² A survey of some of the files concerning the Commonwealth's intention to build a civil nuclear power station at Jervis Bay in the late 1960s/early 1970s does not mention the issue of nuclear submarines, and only mentions the Navy with regard to how such a station would impact on the nearby Naval base and Naval waters of Jervis Bay. For instance, the cabinet submission on the Jervis Bay proposal, see: NAA: A5882, CO11 PART 1, 'Construction of a Commonwealth sponsored nuclear power station in Australia'. On the issue of nuclear weapons for Australia, see: Reynolds, Wayne, *Australia's Bid for the Atomic Bomb*, Melbourne University Press, Melbourne, 2000.

before. What follows is a brief examination of the nuclear-powered submarine discussions being held at high level in the 1960s by certain areas of Defence.

During a series of meetings in October 1959 the Defence Joint Planning Committee sat to consider the introduction of a submarine force in the RAN. Declassified in 2007, the report was published by the Sea Power Centre – Australia in 2008 as discussion on the *Collins* class submarine replacement ramped up.³ The Committee considered many factors and, in the end, endorsed a submarine force for the RAN: ‘We have concluded, the R.A.A.F. member dissenting, that, excluding programme considerations and inter-Service priorities, the institution of a submarine service would be a valuable addition to balanced Australian Defence Forces.’⁴ Of interest to this paper, the committee considered the nuclear propulsion question, saying of it: ‘we believe that eventually most, if not all, submarines will be nuclear powered. For the present, however, the very high cost of such submarines places them out of Australia’s reach.’⁵

The main context for discussing nuclear propulsion for submarines aside from the inherently superior performance over a conventional submarine was the threat posed by China or Indonesia. The main catalysts for Australia to revisit nuclear-powered submarines would be, firstly, either of these countries attaining a high degree of Anti-Submarine efficiency or themselves acquiring nuclear-powered submarines, or secondly, the cost of a nuclear-powered submarine reducing to around twice that of a conventional submarine. The

³ Gilbert, Greg P. ‘Introduction of a Submarine Service 1959’ in *Australian Maritime Issues 2008, SPC-A Annual*, Gregory P Gilbert and Nick Stewart (eds.), Canberra, Sea Power Centre – Australia, 321-348; from the original: NAA A8738, Item 13, ‘Reports of the Joint Planning Committee – 44/1959 to 88/1959. Report No 77/1959: Composition of the Forces – Proposed Introduction of a Submarine Service into the RAN’.

⁴ Gilbert, ‘Introduction of a Submarine Service 1959’, 2009, p. 342.

⁵ Gilbert, ‘Introduction of a Submarine Service 1959’, 2009, p. 338.

committee did not think either eventuality was likely in the following 10 years and hence the recommendation against nuclear-powered submarines at that time.⁶

The prospect of nuclear propulsion for Australian submarines was raised less than two years later. On 3 August 1961, the UK Defence Minister wrote to the Australian Defence Minister about an issue raised by US observers to a recent Commonwealth meeting. The concept under development was for a small nuclear-powered submarine, made of fibreglass, and using nuclear propulsion technology being developed for nuclear powered aircraft. The UK, Australia, and Canada all signalled interest and an informal presentation was arranged by the United Aircraft Corporation, with a report by the Australian Chief Scientist of the Department of Supply representative subsequently forwarding on a report to the Secretary of the Department.⁷

A File Note from 26 October by the Prime Minister's Department recorded that cost was a major deterrent to the RAN establishing a submarine arm, and that the cost and size of nuclear-powered submarines put them out of reach and so the prospect of a small nuclear-powered submarine was worthy of study.⁸ Once again, the issue of cost is raised, though interestingly the larger size of nuclear-powered submarines did not factor into the 1959 discussion. Nevertheless, the appeal of nuclear-powered submarines remained.

On 4 December 1961 there was a meeting of the Defence Research and Development Policy Committee in which the issue was discussed. They noted that without the US taking the lead

⁶ Gilbert, 'Introduction of a Submarine Service 1959', 2009, p. 339.

⁷ Minute, Secretary of Defence, 'Small U.S. Nuclear Submarine Project', 25 September 1961: NAA A5799, 78/1961, 'Small US nuclear submarine project'.

⁸ File Note, Prime Minister's Department, 'Defence Committee Agendum No. 78/1961', 26 October 1961: NAA A1209, 1961/1184, 'USA - Development of a small Nuclear submarine'.

it would require a major European power with US aid to get such a concept up and running, and Australian participation would be contingent on such an eventuality. They also stated that: 'the nuclear Submarine in various forms seems likely to be of great military significance for many years to come and there is, therefore, merit in Australia obtaining as much information as is reasonably available on this branch of military technology.'⁹

The committee saw ongoing merit in sending a member of the Australian Scientific Service to London to take part in studies with the UK and were then advised by the Department of the Navy representative that meetings had already occurred and that an RAN Technical officer in London had attended.¹⁰ In the end it was not to be and a 21 December 1961 minute from the UK Minister of Defence to the Australian Minister relayed that the proposal was not feasible at that time. It would require too long and too much Research and Development to make it workable.

Notably, this was outside the considerations of the reactor itself and so it was not nuclear propulsion that was the sticking point, but the technical questions surrounding a submarine fibreglass hull and the internal systems required for such a submarine.¹¹ It did not take long for Australia to concur with this assessment and the previous Defence Committee Agendum that had discussed the proposal was withdrawn.¹² Thus ended the short-lived investigation of small nuclear-powered submarines for the RAN. While this discussion may have come to

⁹ Minute, Defence Research and Development Policy Committee, 'Minute No. 37/1961 Nuclear Submarine Assessment', 4 December 1961: NAA A5799, 78/1961, 'Small US nuclear submarine project'.

¹⁰ Minute, Defence Research and Development Policy Committee, 'Minute No. 37/1961 Nuclear Submarine Assessment', 4 December 1961: NAA A5799, 78/1961, 'Small US nuclear submarine project'.

¹¹ Letter, Australian Minister of Defence to UK Minister for Defence, 21 December 1961: NAA A1209, 1961/1184, 'USA - Development of a small Nuclear submarine'.

¹² Minute, Secretary Defence Committee, 'Small Nuclear Submarine Project', 4 January 1962: NAA A1209, 1961/1184, 'USA - Development of a small Nuclear submarine'.

nothing, the active investigation by Australia, as well as Canada and the UK is notable. This is especially so for the UK, who by that stage had already begun construction of their first nuclear-powered submarine, HMS *Dreadnought*. It demonstrates a continued interest in nuclear propulsion technology, weighing the costs of such a system against the great benefits in range and capability that such a platform could give a navy.

The issue of nuclear-powered submarines made a brief appearance in US newspapers in 1962. The Australian Ambassador to the USA, Sir Howard Beale, had in early 1962 expressed Australian interest in acquiring nuclear-powered submarines for Australia: 'expressed his country's interest in an atom-powered undersea vessel'. This was reported later in the year in the *New York Times* in an article that reported on the possible transfer of a nuclear-powered submarine to France.¹³ The article notes that both Italy and Australia had expressed interest in 'atomic powered' submarines and were closely watching the negotiations between the US and France. Beale was known as a great proponent of nuclear power,¹⁴ but it seems that Australia's interest in nuclear-powered submarines was far from abnormal in the geopolitical environment of the early 1960s.

Nuclear Propulsion: 1965 discussions

Discussion about nuclear-powered submarines for the RAN took a far more serious turn in 1965 in 'Top Secret' correspondence sent from the Head Australian Joint Services Staff London, Air Vice Marshal Geoff Hartnell, to the Secretary Department of Defence, Sir Edwin

¹³ The 22 October 1962 edition of the *New York Times*. Letter, AE1107/62, Ian J.W. Bisset to Maurice C Timbs, 'Australian request for nuclear submarine?', 23 October 1962: NAA A463, 1962/6384, 'Nuclear submarines for the RAN [Royal Australian Navy] – general'.

¹⁴ Lowe, David, 'Beale, Sir Oliver Howard (1898–1983)', *Australian Dictionary of Biography*, 2007, <https://adb.anu.edu.au/biography/beale-sir-oliver-howard-12187>

Hicks, in mid to late 1965. Writing in June, he relayed that in December 1964 the UK Secretary of State for Defence had called for an up-to-date review of the submarine component of the RN and the submarine rebuilding programme, influenced by the rapid progression in nuclear-powered submarine technology and building. The advent of the nuclear-powered submarine had spurred great Research & Development work in the US, the USSR, and to a lesser extent the UK on ASW, which was seen as rapidly increasing the vulnerability of conventional submarines. He commented that: 'There appears to be as far as the UK is concerned little possibility of improving the conventional type submarine beyond that which has been achieved in the Oberon class submarine.'¹⁵ Following this, he compares the capabilities and limitations of conventional and nuclear-powered submarines, with nuclear-powered submarines clearly superior in almost all respects.

The only advantage of conventional submarines at that time was the passive detection capabilities due to being a quieter listening platform, though work was underway to rectify that issue with new nuclear-powered designs that aimed to have nuclear-powered submarines achieving the same self-noise levels as an *Oberon* by 1971.¹⁶ Indeed, in a follow on letter from 10 June, he included rather strong language on the advantages of the nuclear-powered submarine, as far as the UK was thinking: 'it is claimed that the SSN because of its underwater speed and ability to remain unseen almost indefinitely was as great an advance in warships as steamship over sail'; and that 'the SSN has come into being very rapidly, it is as

¹⁵ This was working on assessment that the *Oberon* was accepted as the quietest conventional submarine in the world. Letter, JST 207/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'The Case for the Nuclear Submarine', 1 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

¹⁶ Letter, JST 220/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 10 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

invulnerable a weapon system as has ever been devised and operated'.¹⁷ These are quite significant claims, and although these are the attitudes and opinions of the UK merely being relayed back to Australia, the implications for the RAN – in the process of acquiring a submarine arm – were rather obvious.

Much of the information concerns the expected proliferation of SSNs and the phase-out of conventional submarines in the UK and US. By 1971 the US was expected to have 84 nuclear-powered submarines and the USSR 88 and even the French and German navies were expected to have four and two, respectively. The UK review supported previous considerations that 12 would be required, replacing all but a few of their 35 conventional submarines.¹⁸ The USN was not building anymore conventional subs and at the conclusion of the Australian and Canadian *Oberon* building programmes the UK was not building any more conventional submarines.¹⁹

It was also thought that China and/or Indonesia may have a nuclear-powered submarine from 1975 onwards and as was stated in the 1959 decision to acquire submarines, one of the parameters for revisiting nuclear-powered submarines for Australia was this eventuality. It was repeated in this 1965 letter: 'it is considered that one nuclear-powered submarine in the enemies' hands is sufficient qualification for counter type SSN vessels.'²⁰ Additionally, SSNs were considered 'essential for training friendly forces on how to hunt enemy SSNs', in

¹⁷ Letter, JST 220/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 10 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

¹⁸ Letter, JST 207/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'The Case for the Nuclear Submarine', 1 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

¹⁹ Letter, JST 207/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'The Case for the Nuclear Submarine', 1 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

²⁰ Letter, JST 207/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'The Case for the Nuclear Submarine', 1 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

addition to being essential for escort duties, especially of troop and material transports, no small consideration for a maritime nation such as Australia.²¹ Finally, he relays that USN studies of the 'Far East' and the operational areas for SSNs showed that there were very few areas where the SSN would not be advantageous or inferior to a conventional submarine, again very salient information for Australia.²²



Figure 1: Geoff Hartnell, 1945, Australian War Memorial, SUK14870

These letters contain a wealth of information, including technical information as well as tactical and strategic considerations on why nuclear-powered submarines were fast becoming the premier naval technology. Having discussed what made nuclear-powered

²¹ Letter, JST 207/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'The Case for the Nuclear Submarine', 1 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

²² Letter, JST 207/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'The Case for the Nuclear Submarine', 1 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

submarines so appealing; the correspondence does turn to practical matters for Australia's consideration. In the original 1959 submarine decision cost had been a deterrent to acquiring nuclear-powered submarines. In his 10 June 1965 letter, AVM Hartnell makes the powerful observation that: 'it is not possible to quantify cost effectiveness of a nuclear-powered submarine compared with a conventional. In the first and over-riding case the problem is not one of comparing like with like.'²³ The implication is that comparing the cost of one nuclear-powered versus one conventional is unhelpful, and as his previous and subsequent observations on the capabilities and advantages of the nuclear-powered submarines makes clear a nuclear-powered submarine would be worth two or even three conventional submarines.

It is at the end of the letter that we see the clearest hint that these discussions are potentially relevant to Australia. AVM Hartnell says that: 'Smaller nations graduating from conventional to nuclear-powered are estimated to require 4 to 5 conventionals to support the first nuclear-powered. This covers training and necessary experience required.'; and, 'From current studies it appears that to have two nuclears always operational three nuclears are required and it is suggested that with a backing of 4 or 5 conventional the three nuclears could be purchased over a period of 8 years.'²⁴ Such information is relevant to Australia's situation of acquiring four conventionally powered submarines at that time. It is also interesting to note the numbers of conventional submarines thought to be required to introduce a nuclear-

²³ Letter, JST 220/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 10 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

²⁴ Letter, JST 220/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 10 June 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

powered submarine capability, no doubt of interest in light of current AUKUS nuclear submarine considerations.

Context is everything, and so it is important to appreciate that these discussions come at a time when the RAN has not only placed an order for four *Oberon* class conventional submarines, but as these submarines were under construction in the UK and the first prospective RAN submariners were undergoing training in HMS *Dolphin*. Having obtained information on nuclear-powered submarines from officers within the UK Ministry of Defence, Air Vice Marshal Hartnell followed up his June letters with one in October, writing to the Secretary:

'It is considered that to start a nuclear programme within the present framework of the RAN submarine force, it would be desirable to add two nuclears to the present force of four conventionals. This would mean, generally speaking, three OBERONS and one nuclear would be available at sea when required except during maintenance/leave periods.'²⁵

What follows is information on the training requirements for the RAN for a mixed fleet of conventional and nuclear-powered submarines. Discussions with the RN determined that the total manpower requirement of officers and men would be about 600 personnel, not including maintenance and support personnel, but including spare crew and drafting margins.²⁶

Hartnell lays out a detailed examination on the timing of the RAN to start creating a nuclear component of its submarine force. Again of contemporary interest, he notes that 'the main

²⁵ Letter, JST 383/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 20 October 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

²⁶ Letter, JST 383/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 20 October 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

impediment is that of providing suitably trained officers' and that 'it is clear that technical officers are the main limiting factor and if the officers are to be RAN then an early decision would be required'.²⁷ To this, he adds a brief outline of training times and requirements.

On the assumption that the total building time for a nuclear-powered submarine would be four and a half years, he lists the time increments for officers joining the first submarine, with the earliest requirement being the first pair of technical officers, Electrical and Engineering, needing to join two and a half years before acceptance and the latest being the CO, who would join at nine months before acceptance.²⁸ Prior to joining a nuclear-powered submarine, the minimum qualifications for the officers would be:

i) Technical Officers. They must complete UK training with one year's experience in a UK submarine then stand by an Oberon RAN Submarine building and run it for at least one year (2 years if no stand-by experience) and they must complete the following courses: Nuclear Research Course (6 months); N.U.S.O.T. at Dounreay (13 weeks); Additional in UK SSN (2 months)

ii) Seamen Officers. 18 months in command or as First Lieutenant of an RAN Oberon followed by Nuclear General Course (3 months or so) and 2 months if possible in a UK SSN.²⁹

From these calculations, AVM Hartnell concludes that if the first pair of RAN technical officers could be made available for nuclear training early in 1968 then the second pair could be available to stand-by a nuclear-powered submarine at the beginning of 1970. That would mean that the earliest date by which a nuclear-powered submarine could be made available

²⁷ Letter, JST 383/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 20 October 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

²⁸ Letter, JST 383/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 20 October 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

²⁹ Letter, JST 383/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 20 October 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

to the RAN with fully qualified RAN technical officers would be early 1972.³⁰ Thus AVM Hartnell's information gathering campaign in the UK not only made a case for the efficacy of nuclear-powered submarines, but also provided the Australian Secretary of Defence with a rough outline of what would be required, training-wise at least, to acquire nuclear-powered submarines in parallel with the already underway *Oberon* building program.

There was further correspondence on broader nuclear-powered submarine issues. A 14 December 1965 letter concerned the UK's plan to use HMS *Verulum* to conduct research and trials in the 'Far East' in September/October 1966. The submarine was going to be used to further the propagation studies associated with the functional role of the nuclear-powered submarine and its sonar. This was to be followed by HMS *Dreadnought* conducting trials in the 'Far East' in early 1967. It was hoped that this would aid in a much better exchange of information with the USA concerning the nuclear-powered submarine and its use in the 'Far East'. However, as interesting as all this information was, there are signs that the RAN perhaps did not share in the enthusiasm.

In a 1 December 1965 letter, the Deputy Chief of Naval Staff (DCNS), Rear Admiral Richard Peek,³¹ wrote to the First Assistant Secretary (Defence Science), Dr E.L.D. ('Ted') White, and Deputy Secretary of Defence (B), Gordon Blakers, simultaneously thankful of the information being passed and concerned that discussions of submarines and submarine policy were taking place outside of the RAN. Pen script from the Dr White indicated that he took the point

³⁰ Letter, JST 383/1965, Air Vice Marshal Hartnell to Secretary, Department of Defence 'Nuclear Submarines', 20 October 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

³¹ Later Vice Admiral and Chief of Naval Staff, knighted in 1972.

and wished to discuss further with the Deputy Secretary.³² From here correspondence regarding nuclear-powered submarines for the RAN seems to dry up. The issue is mentioned tangentially in a 1970 Cable from the Australian Embassy in Paris to Sir Philip Baxter concerning discussions Australia had with CEA – the French Alternative Energies and Atomic Energy Commission.

It notes that:

'The French have now had one of their Nuclear Submarines on ocean trials for six months without incident. The design represents a considerable advance both on U.S. designs and on Otto Hahn. If this is of interest to the Navy or to the National Shipping Line and B.H.P for bulk cargo handling, CEA would be very happy to discuss all aspects.'³³

Nothing seems to have come from this, but it is interesting to note that the idea of nuclear-powered submarines was still alive in some sense. It is further noteworthy that these discussions are with the French, rather than the US or UK, and that the French were willing to discuss the issue with Australia. It was not long after this that a further two *Oberon's* were ordered for the RAN, something that would seem to indicate that the end of any immediate interest in a mixed fleet of conventional and nuclear-powered submarines for the RAN.

³² Letter, DSC/COS/145, D.C.N.S to First Assistant Secretary (Defence Science) and Deputy Secretary (B), Department of Defence, 'Nuclear Submarines', 1 December 1965: NAA A1209, 1963/6644, 'UK nuclear powered submarine'.

³³ The Otto Hahn was an experimental nuclear powered cargo ship used as a testbed for nuclear power in commercial applications. Cable, Australian Embassy Paris to ATOMCOM Canberra, 30 January 1970; NAA A5882, CO11 Part 1, 'Construction of a Commonwealth sponsored nuclear power station in Australia'.

Nuclear-Powered Submarine visits

Another element which appears to at least corroborate a heightened Australian interest in nuclear-powered submarines are some interesting visits by nuclear submarines to Australia, and Australian personnel visits to nuclear-powered submarines, in the 1960s. The first and perhaps most interesting visit was that of USS *Halibut II* (SSG(N)-587) and USS *Canberra*, who visited Sydney between 1-7 May 1960, after they had visited Wellington in New Zealand. USS *Halibut* was the USN's first nuclear-cruise missile armed submarine, carrying the Regulus I missile and was the short-lived predecessor to Polaris-armed SSBNs. The trip to Australia was her shakedown cruise where she became the first SSN to fire a cruise missile.³⁴ It was also the first visit of a nuclear-powered submarine to Australia. The visit attracted much attention, with several thousand onlookers on the nearby wharves and the Domain watching as *Halibut* demonstrated the preparations for launch, opening the launch housing, and displaying a Regulus missile.³⁵

³⁴ US Naval History and Heritage Command, 'Halibut II (SSG(N)-587)', *Dictionary of American Naval Fighting Ships*, <https://www.history.navy.mil/research/histories/ship-histories/danfs/h/halibut-ii.html>

³⁵ Royal Australian Navy, *Navy News*, Vol. 3, No. 9, 6 May 1960, <https://www.navy.gov.au/media-room/publications/navy-news/1960>



Figure 2: *Navy News* Vol.3 No. 9, 6 May 1960, Sea Power Centre Australia

The next visit by a nuclear-powered submarine appears to have been the *Skipjack*-class SSN USS *Sculpin* (SSN 590), visiting Sydney for 17 days, between 2-18 May 1964. Like *Halibut*'s visit before it coincided with commemorations for the Battle of the Coral Sea, though at 17 days duration it was quite a lengthy visit. According to the Deck Log, *Sculpin* got underway on the 5th of May for nine hours and conducted local area operations and exercises.³⁶

The Commanding Officer, Commander Robert W. Dickieson, was invited to give a talk to the Australian Institute of Navigation about US nuclear-powered submarines. Of note, he mentioned that all US Submariner officers were personally interviewed by Vice Admiral Rickover, and that not all of them necessarily had engineering backgrounds and that a

³⁶ USS *Sculpin* Deck Log, May 1964, U.S. National Archives and Records Administration, NND 927605.

previous *Sculpin* engineering officer had majored in English literature before conducting the 12 months of theoretical and practical courses necessary for all officers serving aboard nuclear-powered submarines. He also noted that most of the enlisted sailors had a background in diesel submarines before transferring to nuclear submarines after screening.³⁷ While *Sculpin's* visit and the Sydney sea-day conducted certainly come at a time of interest in nuclear-powered submarines in Australia, it seems impossible to know if it was coincidence, academic interest, or more serious fact-finding on behalf of the RAN.

As for visits by RAN personnel overseas, a year prior to *Sculpin's* Sydney visit, the Australian Naval Attaché in Washington was accompanied by another RAN officer to visit the USN submarine base at New London, Connecticut and conducted a one-day sea-ride aboard USS *Skate* (SSN-578) on 22 April 1963.³⁸ Interestingly, on 16 November 1963 two Australian Scientific officers arrived in the US for a December for an Underwater Acoustics Symposium, which included talks on the highly sensitive Sound Surveillance System (SOSUS). Although security issues meant the Australians were excluded from some elements of classified material, they still gained access to 'all information they required'.³⁹ Again, this is but a short glimpse of what was happening in the realm of underwater warfare, but for Australians to have attended such a forum, before having any submarines in service, is noteworthy.

Whatever links had been established between RAN and USN submariners seemed to have continued over the next few years as the RAN commissioned its first Submarines in the UK.

³⁷ Royal Australian Navy, *Navy News*, Vol. 7, No. 11, 29 May 1964, <https://www.navy.gov.au/media-room/publications/navy-news/1964>

³⁸ Captain I.H. Cartwright, Naval Attaché Washington D.C. 'Report of Proceedings – Quarter Ended 30 June 1963,' 1 July 1963, Australian War Memorial, AWM78 447/2.

³⁹ Captain I.H. Cartwright, Naval Attaché Washington D.C. 'Report of Proceedings – Quarter Ended 31st December 1963,' 10 January 1964, Australian War Memorial, AWM78 447/2.

After two weeks of maintenance post-commissioning, HMAS *Otway* departed Faslane on the morning of 12 July 1968 and conducted a short visit to the USS *Simon Lake*, the depot ship for the US Polaris Submarine Squadron in the 'Holy Loch'. The CO of *Otway* noted that 'A good liaison has existed for some time with this squadron, and I had been invited to make this visit by Captain Woodall, USN, COMSUBRON 14.'⁴⁰ What this 'good liaison' entailed is a mystery, but certainly noteworthy, not the least since it was a depot ship for nuclear-powered and armed Polaris missile submarines. It does seem to indicate that while the first RAN submarines were commissioning in the UK, and RAN submariners training there, a conscious effort was made to establish and maintain a link with the USN submarine force.

From these records, it is clear that the issue of nuclear-powered submarines was one considered from the very beginning of Australia's efforts to rebuild a submarine capability in the late 1950s and early 1960s. While the initial decision to order four conventionally powered *Oberon* class submarines went ahead, the question of nuclear propulsion did not go away, even as the submarines were under construction and their crew undertaking training and sea service in the UK.

Of note is the fact that serious thought was put into what would be required training-wise to acquire SSNs for the RAN. It is also worth noting that these discussions appeared to be entirely unconnected with any effort by Australia to acquire nuclear power for civilian applications, even though these discussions were being held elsewhere. This is not to say the two were unconnected or irrelevant to each other, but to mark the fact that in the context of acquiring SSNs, what was then one of if not the most potent system of naval technology, it was being considered on its own merits rather than requiring a domestic nuclear industry.

⁴⁰ HMAS *Otway*, 'Report of Proceedings', 8 August 1968; Australian War Memorial, AWM78 285/1.

This also came at a time when nuclear-powered submarines required re-fuelling far more often than modern nuclear submarines. It is not that the information about nuclear-powered submarines in the 1960s can be a blueprint for AUKUS nuclear submarines, but to highlight that these questions have been asked and answered before and that Australia, the UK, and the US have a history of defence cooperation, including in the realm of submarines, conventional and nuclear-powered.