

ARCHIVED REPORT

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Attack Class

Outlook

- Australia cancels deal for 12 SSKs from France
- Chooses American technology-based nuclear submarine over conventionally powered
- Design likely to be a variant of U.K. Astute class or U.S. Virginia class
- First SSN submarine not likely to enter operation until 2040, outside of forecast range
- This report will be archived next year

Orientation

Description. Diesel-electric-powered patrol submarine (SSK). Defence Materiel Organization: Director, Future Submarine Capability Development + 61 2 6265 2262

Sponsor

Australian Department of Defence
 Navy Office
 Queen Victoria Terrace
 PO Box E33
 Canberra, ACT 2600
 Australia
 Tel: + 61 6 265 9111
 Fax: + 61 6 265 4790

SEA 1000 Project Director (Platform Aspects)
 + 61 2 6265 3519

Status. Program canceled

Total Produced. Plans now are to produce 8-12 nuclear submarines (SSN) of this class.

Pennant List

<u>Name</u>	<u>Shipyard</u>	<u>Laid Down</u>	<u>Launched</u>	<u>Commission Date</u>
Future SSN (Attack Class SSK Replacement)	Australian Submarine Corporation			2040
TBA	Australian Submarine Corporation			2042
TBA	Australian Submarine Corporation			2043
TBA	Australian Submarine Corporation			2044
TBA	Australian Submarine Corporation			2045
TBA	Australian Submarine Corporation			2046
TBA	Australian Submarine Corporation			2047
TBA	Australian Submarine Corporation			2048
TBA	Australian Submarine Corporation			2049
TBA	Australian Submarine Corporation			2050
TBA	Australian Submarine Corporation			2051
TBA	Australian Submarine Corporation			2052

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Price Range. Still way too early in the game, but a price of \$2.5 billion - \$3.5 billion per submarine can be expected for the future SSN.

Contractors

Prime

Australian Submarine Corporation Pty Ltd	http://www.asc.com.au/ , GPO Box 2472, Adelaide, SA, Australia, Tel: + 61 8 83 48 70 00, Fax: + 61 8 83 48 70 01, Licensee
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Subcontractor

Lockheed Martin Rotary and Mission Systems	http://www.lockheedmartin.com , 199 Borton Landing Rd, PO Box 1027, Moorestown, NJ 08057-0927 United States, Tel: + 1 (856) 722-4100 (C4I Systems)
Thales Underwater Systems	http://www.thalesgroup.com , 525 Route des Dolines, BP 157, Sophia Antipolis, France, Tel: + 33 4 92 96 30 00, Fax: + 33 4 92 96 41 24, Email: tus@thales-underwater.com (Sonar Suite)

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Shortfin Barracuda Attack Class SSK

Characteristics

Speed (submerged)	25+ kt
Speed (surfaced)	14 kt
Maximum safe depth	350 m (1,300 ft)
Endurance	70 days
Crew	8 officers, 52 enlisted (2 crew)

Dimensions

	<u>Metric</u>	<u>U.S.</u>
Length overall	99.5 m	326.5 ft
Beam	8.8 m	28.9 ft
Draft	7 m	23 ft
Displacement (surfaced)		4,765 tons
Displacement (submerged)		5,000 tons

Armament

	<u>Type</u>	<u>Quantity</u>
Torpedo tubes	21 in	4
Torpedoes	Mk 48 CBASS	20
Missiles	SM39 Exocet/SCALP	24 (in place of torpedoes)
Mines	FG 29 mines	28 (in place of torpedoes)

Design Features. The submarines were to have an air-independent propulsion (AIP) system that allows them to remain underwater much longer than the Collins class boats. The submarines were also have state-of-the-art batteries and sophisticated communications.

The combat system selected for the SEA 1000 submarines was likely to represent a follow-on to the Replacement Combat System (RCS) of the Collins

class. This meant that the ongoing U.S. program to upgrade the BYG-1 system could have provided upgrades that were also usable by Australia. This combat system, continuously upgraded, is likely to remain the U.S. Navy's standard for the foreseeable future, as it uses commercial off-the-shelf (COTS) components and open system standards intended to operate in a networked environment. The U.S. is

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committed to upgrading this system under a technology insertion program (TIP). Advanced Processing Builds (APBs) for both tactical control and weapons control are currently funded.

The emerging competition between combat systems integrators for the SEA 1000 program suggests that it would not have been an off-the-shelf foreign system. Raytheon Australia and Lockheed Martin Australia (teaming with Australia's Acacia Research) are among those to announce they will compete. Raytheon in particular has had a long involvement with Collins; it acquired the original combat system via Boeing, which in turn had purchased the business from Rockwell.

Operational Characteristics. The official description of the program in the 2009 defense review stated that the Future Submarine would be capable of a range of tasks such as anti-ship and anti-submarine warfare, strategic strike, mine detection and minelaying

operations, intelligence collection, support of special forces (including infiltration and exfiltration missions), and the gathering of battlespace data in support of operations.

These require the new submarines to be better armed than the Collins class. They are likely to carry long-range cruise missiles in addition to shorter-range missiles and torpedoes. The new submarines may also carry midget submarines that will be used to collect intelligence or land special forces troops.

Long transits and potentially short-notice contingencies in Australia's primary operational environment demand high levels of mobility and endurance in the Future Submarine. The boats need to be able to undertake prolonged covert patrols over the full distance of the country's strategic approaches and in operational areas. They require low signatures across all spectrums, including at higher speeds.

Variants/Upgrades

SEA 1000. Official Australian designation for the program to replace the Collins class SSKs.

Shortfin Barracuda. The Shortfin Barracuda Block 1A was designed by DCNS (now Naval Group) specifically for the Royal Australian Navy. It was to be

a conventionally powered submarine with the design of the nuclear-powered Barracuda SSN. However, despite work already being in progress, Australia canceled the contract in September 2021 after being granted access to U.S. nuclear submarine technology.

Program Review

Background. In December 2007, the Australian minister for defense, Joel Fitzgibbon, authorized the RAN to begin planning project SEA 1000 – the official designation for the program to replace the six Collins class submarines. A target date of 2025 was established for the commissioning of the first-of-class. A project office to oversee development of the new submarine was set up in October 2008 to be jointly administered by the Defence Materiel Organization (DMO) and the Department of Defence's Capability Development Group.

In the 2009 Defence White Paper, the Australian government confirmed its intention to double Australia's submarine force to 12 boats to keep pace with the increased number of submarines in Australia's region. Rear Adm. Rowan Moffitt was appointed to head SEA 1000. Moffitt immediately assumed responsibility for the submarine program, reporting to the DMO, Capability Development Group Future Submarine Project Office, headed by Dr. Stephen Gumley.

Due to the project's complexity, it was expected that it would take 17 years to design the submarines, gain government approval for the project, and complete the first boat in the class. The timeline for the project called

for research into the submarines to be completed by 2012, but this target was never met and the preliminary design process was not completed until 2018. The Federal Cabinet then gave initial approval for the design in March 2019, after which detailed design commenced. The sea trials for the first new submarine were tentatively scheduled for 2024 so that the boat would be ready by 2025, when the first Collins class submarine is scheduled to be decommissioned. Again, this schedule never came close to being met.

The new class of submarines was expected to be a unique Australian design rather than a variant of an existing foreign design. While the Navy's study considered all submarine options, including the acquisition of nuclear-powered submarines, the final design was expected to be a larger, quieter, faster, and better-armed version of the Collins class. The government has explicitly ruled out the procurement of a nuclear-powered submarine despite the instruction that the Navy include that option in its studies.

While the government initially promised in May 2009 that the submarines would be built by ASC (formerly Australian Submarine Corporation) in Adelaide, South Australia, it that announced that ASC would possibly

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have to bid against other companies, though the submarines would still be built in Adelaide regardless of which company won the tender. ASC built all of the Collins class boats and operates the only submarine construction facility in Australia.

First Responses

The first response to the announcement of the Australian submarine program came from HDW. The German design team released details of Type 216, a proposed conventional propulsion long-range submarine designed specifically to meet the requirements of countries needing a larger, longer-endurance submarine than the standard Type 214. The Type 216 is characterized by high speed, long range, long duration mission capability, and flexibility in equipment layout. The Type 216 will have a displacement of around 4,000 tons, with a crew of 33. Range will be 10,400 nautical miles at 10 knots, with an endurance of 80 days. The submarine will have a hull length of 89 meters, a beam of 8.1 meters, and a maximum draft of 6.6 meters. The Type 216 will be armed with six 21-inch torpedo tubes and two vertical launch systems for cruise missiles. It will be built out of HY-80 steel and use lithium-ion batteries.

It was confidently expected that the French would be following this announcement with a rival design based on the Scorpene class. While Spain proposed an enlarged version of its S-80 in response to the Australian requirement, the French team did not initially respond with a publicly announced design. This was surprising, but a greater shock was in the wings. In July 2012 it was revealed that the Royal Australian Navy was looking at the Japanese Soryu class diesel-electric submarine.

The possibility of buying a Japanese design was opened in December 2011, when Japan lifted a post-World War II embargo on defense exports. Rear Adm. Rowan Moffitt and defense scientist Dr. Alexander Zelinsky visited Japan to see the new submarine in service with the Japanese Navy. In one respect, the news was logical, since the 4,200-metric-ton Soryu boats are the only new conventional submarines to meet the size and capabilities demanded in Australia's 2009 white paper. However, given the pattern of Japanese submarine construction, it was quite possible that the Soryu class would have been replaced by an even more modern design by the time the Australians made their decision. If so, then an Australian commitment to a Japanese design would allow Australian designers and operational analysts to influence the design of the next generation of Japanese boats.

The possibility that the Australian Navy would opt for a Japanese design raised controversy, with demands that

the money and jobs be kept in Australia. Defence Teaming Centre Chief Executive Officer Chris Burns said, "If we can take a Japanese design and adapt it to Australia's needs and then fabricate it in SA, then that's investing in Australian jobs, Australian innovation, and Australian security for the future. But if this is an option to go and buy a Japanese off-the-shelf submarine, then we're sending Australian taxpayers' dollars and Australian jobs offshore."

The technology transfer agreement with Japan was followed by one with Sweden. This related to intellectual property rights for submarine design and technology. This agreement gave effect to Australia's rights to use and disclose Swedish intellectual property for complex submarine design and technology. It cleared the way for the SEA 1000 submarines to be an evolved Collins class option. Before this could occur, however, Australia needed to reach an agreement with Sweden on the use of Collins and other Swedish technology for the Future Submarine Program. That contractual requirement later appeared to be in place.

The Nuclear Issue

On August 12, 2013, the University College London, International Energy Policy Institute in Adelaide published a paper arguing that it is entirely feasible for Australia to replace its submarines with nuclear-powered craft having the same cost as conventional designs. The paper rejects the argument that Australia does not possess the infrastructure or domestic nuclear industry needed to support a nuclear fleet. Its authors point out that Brazil is developing a nuclear submarine fleet without a nuclear weapons industry. The paper concluded that nuclear submarine costs are competitive, with overall costs at \$1.8 billion to \$2.7 billion. Suppliers of nuclear boats would likely be close allies, the paper argued, as the program could use U.S. surplus ships, utilize the military cooperation agreement with Britain, or use France as a source, though with less advanced technology.

By late 2013 it was becoming apparent to both the Australian Navy and the government that the Initial Operational Capability (IOC) date of 2025 for the first of the SEA 1000 submarines was unrealistic. The date gave Australia only seven years to determine the design and configuration of the SEA 1000 submarines, complete the detail design and technology evaluations, and resolve the lingering operational questions. Moreover, the existing Collins class would start to leave service in 2025, so even on the existing schedule there would be a capability gap in the late 2020s. When a realistic schedule was superimposed on the existing program, the "limited capability gap" became a "no capability at all gap."

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One solution that received careful evaluation was the possibility of a Service Life Extension Program (SLEP) that would allow the Collins class to bridge the yawning capability gap. A study of the feasibility of a SLEP concluded that there was no single critical technical issue that would prevent a service life extension of around seven years for the class. There were, however, a total of 68 major technical issues that would combine to make a service life extension of the Collins class "unachievable." These included weight growth, heat management, radiated noise, and diesel machinery reliability. Veteran observers of the Collins class recognized these as bugbears that had plagued the Collins class since its inception.

Although the 2013 Defence White Paper had narrowed the options for SEA 1000 to either a clean-sheet design or a derivative of the Collins class, the schedule and capability gap issues threw doubts on the viability of either option. It quickly became apparent that a derivative of the Collins class lacking its basic design deficiencies would be a clean-sheet project, and there just wasn't time. The evolved Collins design was soon regarded as requiring so much effort that a new design was inevitable. A realistic schedule assessment showed that 2030 was the earliest that IOC could be expected for a project of that magnitude. A "no capability at all gap" was simply inevitable if grandiose proposals for an all-new Australian submarine design were to be entertained.

The Japanese Option

The situation changed in early 2014 when Australian Defence Minister David Johnston reopened contacts with the Japanese government over the procurement of Japanese submarine machinery for SEA 1000. He described the Kawasaki-built powertrain for the Soryu class as being of "extraordinarily high efficiency and output."

By June 2014, Japan and Australia had negotiated an agreement to develop "stealth submarine technology." This was widely understood to mean that the two countries would jointly develop a range of submarine technologies based on Japan's highly advanced AIP systems. As part of the statement announcing this agreement, Johnston said that all options for SEA 1000 were open, thus reversing the decision made in the 2013 Defence White Paper to eliminate an off-the-shelf solution.

At this point, the possibility that the Soryu design could provide a solution to SEA 1000 that would be available by 2025 and would cost much less than the AUD36 billion estimated for the suggested clean-sheet design reappeared. Japan had made legal changes that allowed the country to export military equipment, and a

Soryu sale would clearly emphasize the importance of that change. It would also be of immense political importance in that it would establish a new strategic relationship between Japan and Australia. Another key point was that the Soryu is a proven and tested design, the product of three generations of design evolution and improvement that eliminate all technical risk from the proposed deal.

By late 2014, the attractions of the Japanese deal were such that an off-the-shelf purchase of Soryu class submarines was regarded as the leading option in the search for a solution to SEA 1000. The Japanese were reported to have set a unit price of \$540 million for a Soryu produced in a Kawasaki or Mitsubishi yard. Even allowing for the costs of developing a modified version of the Soryu that would meet Australian and future Japanese requirements, that estimate would bring the whole SEA 1000 program in substantially under the original budget estimates. This option would also completely eliminate the submarine capability gap.

Meanwhile, international events had conspired to eliminate most of the other alternatives to a Soryu purchase. The leading alternatives were the evolved Collins class produced by ThyssenKrupp Marine Systems (TKMS AB) in Sweden and the Type 216 submarine produced by ThyssenKrupp Marine Systems in Germany. The problem was that the Swedish government was extremely unhappy over the policy of TKMS toward its Swedish subsidiary, and had come to believe that TKMS bought the Swedish concern simply to eliminate a rival. After a remarkably ill-tempered dispute that involved midnight raids on design offices and much poaching of valuable engineering staff, an agreement was struck wherein Saab bought the Swedish subsidiary of TKMS.

Though that battle eventually reached its end with Sweden-Saab standing as the victor, another front in the Sweden-TKMS war opened up in Australia. Saab and TKMS squared off in Canberra in what reportedly became another ugly behind-the-scenes contest. By late 2014, this conflict had been joined by DCNS, which opened an office in Canberra to promote its SMX Ocean attack submarine concept. This is essentially a conventional version of the Barracuda SSN due to enter French Navy service in the next few years. As the SMX Ocean concept evolved, it was renamed Shortfin Barracuda to emphasize its links with the SSN.

Battle Is Joined

Despite the surge of European interest in the Australian program, the Japanese Soryu class remained the favored option of the Australian government. A key point was the price tag for the full 12-ship program. The estimated cost to Australia would be \$22 billion, at least

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\$14 billion less than any competitive option. A mark of how much the Soryu was favored by the government came when Prime Minister Tony Abbott stated that he "wanted the best quality of submarine at the best price, regardless of where it was built." This statement removed one of the reservations expressed by the Japanese.

At this point, a question was raised about a Japanese decision to adopt lithium-ion batteries for the last four submarines of the Soryu class to be built for the Japanese Navy. This battery technology has come under a degree of suspicion following battery fires on Boeing 787 aircraft, and the point was quickly seized upon by other contestants for the SEA 1000 program.

On February 20, 2015, the Australian government announced that three key strategic considerations would determine the results of a competitive evaluation between TKMS, DCNS, and the Japanese (Saab was pointedly excluded). These considerations were that the future submarines would have a range and endurance similar to those of the Collins class and better sensor performance and stealth than the Collins class. Also, the Collins combat system and Mk 48 Mod 7 torpedo would be the preferred combat system and main weapon for the Future Submarines.

In February 2016, Prime Minister Malcolm Turnbull unveiled Australia's long-awaited Defence White Paper confirming that 12 submarines would be purchased and that Australian industrial involvement would be maximized. Australian officials were keen on the latter aspect – for both national industry and political reasons.

Despite multiple political complexities and partisan maneuvering by the Australian political parties in the face of an upcoming election, Australia opted for France's bid on technical, rather than political, grounds. The DCNS bid was seen as best meeting Australia's requirements for submarines with considerable range and superior sensor performance and stealth characteristics. DCNS would also provide an industrial partner for Australia's ASC with a track record in executing transfer-of-technology arrangements in submarine development projects with international partners.

Under the competitive bid put forth, all 12 submarines would be built at ASC's Osborne shipyards in Adelaide. Each submarine would be equipped with the Mk 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) torpedo jointly developed by Australia and the United States, as well as an American-designed combat system – the General Dynamics BYG-1 already fixed on the Collins class boats. The latter aspect

appeared to be a sticking point for the French bid in the run-up to a final Australian decision. Reports indicated that American officials had pushed Canberra on accepting the Japanese proposal, warning that the U.S. might not allow the combat system to be installed on European submarines.

The receipt of apparent assurances from the White House and Prime Minister Turnbull that no such restrictions would be placed on a sovereign Australian decision, and Japanese inexperience in setting up the kind of complex multinational deal inherent in the Australian requirement, meant that Australian defense officials were unanimous in favor of the French proposal.

In September 2017, Naval Group (formerly DCNS) commenced operations at its new Australian headquarters in Adelaide. The company consisted of 40 staff, a mix of French and Australians, who were working on the early phases of the Future Submarine Program, including submarine design, supplier engagement, and infrastructure planning for the new submarine shipyard. Herve Guillou, global chairman and chief executive of Naval Group, said the commencement of survey work signified another milestone in the program. "To inform the design of the construction yard in Adelaide, where Australia's fleet of regionally superior Future Submarines will be built, we will be commencing comprehensive survey work in the Osborne precinct," he said.

In December 2018, the submarines had been designated the Attack class, with the lead submarine being named HMAS *Attack*. After further significant delays in finalizing the contracts with Naval Group and ASC, final confirmation of the project was announced in March 2019. This allowed final design to proceed, although the lead submarine would not commission until the "early 2030s in the earliest."

In August 2020, a report by the Australian National Audit Office stated that the first submarine could not be delivered before 2034.

Australia Cancels French Buy in Favor of American Nuclear Technology

In September 2021, Australia canceled its contract with France's Naval Group for 12 Shortfin Barracuda class submarines (the Shortfin being a conventionally powered variant of the nuclear-powered Barracuda) in favor of American technology-backed nuclear submarines, sending economic and political shockwaves throughout the world.

Funding

Funding for SEA 1000 is provided by the Australian government. The total cost of the SSK program stood at approximately AUD90 billion as of August 2020 before being terminated a year later in 2021. To put this into context, this was roughly four times the cost of the Japanese 2015 Soryu bid. The unit cost of an Attack class SSK was reportedly more than two and a half times that of a U.S. Navy Virginia class SSN. There has been no reliable cost estimate publicized now that the SEA 1000 plans to go with nuclear SSN submarines.

Contracts/Orders & Options

No contractual information has been released.

Worldwide Distribution/Inventories

Australia. 8-12 nuclear submarines of this class are now planned.

Forecast Rationale

Australia's cancellation in September 2021 of its contract with France's Naval Group for 12 Shortfin Barracuda class submarines (the Shortfin being a conventionally powered variant of the nuclear-powered Barracuda) in favor of American technology-backed nuclear submarines has sent economic and political shockwaves throughout the world. Such "overt" intervention into Asian waters by the U.K. and U.S. will likely see a swift, chest-beating response by China through an increase in the buildup of outposts in the Spratly Islands, as well as an acceleration in the pace of warship construction, which is already running high.

Interestingly, as nations face funding crises and are compelled to make cuts in their naval force structures, their submarine fleets tend to be the least affected by these economies. While both surface ships and submarines may be reduced in number and suffer delays as their obsolete tonnage is replaced, it will be the submarines that survive the longest. This is because submarine fleets offer a cost-effective means of delivering naval firepower that is unmatched by any other unit, save the nuclear-powered aircraft carrier.

The submarine market is also affected by purely political issues. The ship-killing capability of modern submarines means that they are a major component of the offensive capability displayed by a fleet. Thus, to be taken seriously as a regional naval power, a country has to deploy a viable submarine force.

Nuclear-powered attack submarines take this ship-killing capability and add unprecedented strategic mobility that allows rapid worldwide deployment. Thus, to be taken seriously as a world naval power, a nation has to operate SSNs. These political considerations drive submarine demand as effectively as any operational or strategic motivations do.

Of late there has been an increasing perception, in the United States in particular, that the current submarine fleets are inadequate in numbers to face the demands placed upon them. This perception is being matched by increased submarine procurement. Should this trend hold, the market prospects for the submarine sector are optimistic.

By the time Australia gets its first "American" nuclear submarine operational around 2040, the area of the South China Sea around the Spratly Islands may already have become the Beijing Riviera. As much as China is known for playing the long game (in many cases decades), it is not going to wait that long. With a 30-year head start in the region, China will likely go all in – backed by its global economic clout – before the rest of the world can respond rapidly enough in a conventional and diplomatic manner.

Initial future SSN submarine production is currently beyond the forecast range.

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