

Abstract

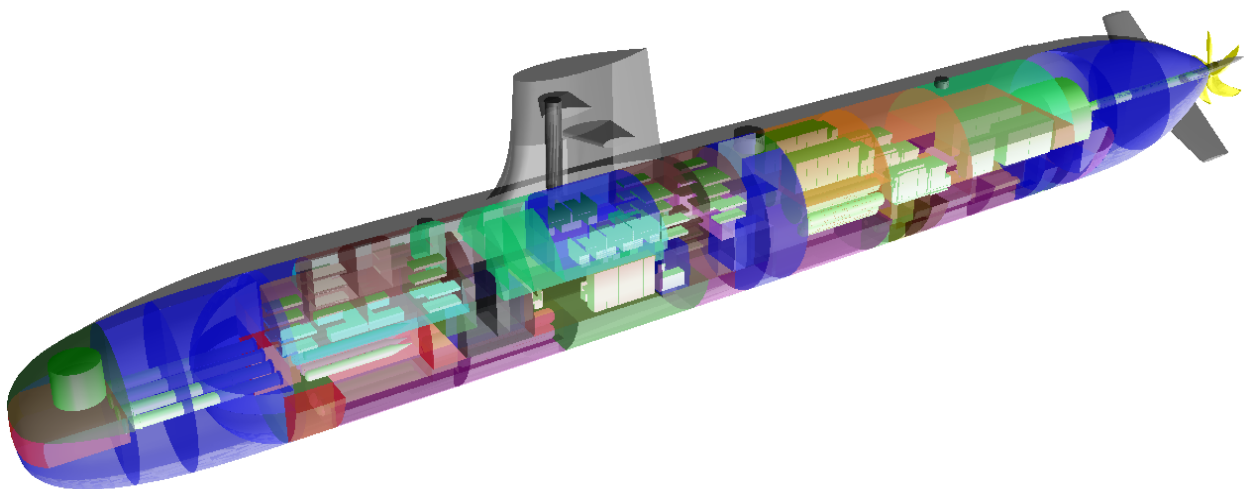
Collins Class Replacement (CCR) SSK

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The Royal Australian Navy's (RAN) *Collins* class submarine has entered the second half of its design life and the RAN has begun their design process for their next-generation submarine. In the early stages of this process, several open-source documents were produced by the Australian government that identified their needs and priorities; using these documents and knowledge acquired from MIT and professional experience, an initial design for a *Collins* Class Replacement (CCR) was created.

To ensure maritime security "in the Asia Pacific Century¹," the Australians require a long-range, high-endurance, multi-mission-capable, cost-effective submarine. To meet these requirements, various Air Independent Propulsion (AIP) technologies, payload, structural, and arrangement configurations were considered. Utilizing tools such as Paramarine™, MATLAB®, ADINA®, and an MIT-developed Mathcad model, and using data available on the *Collins* as a baseline, the CCR was designed to balance these requirements. Four of the major design features combined into the CCR were: inclusion of a high-power, Fuel Cell AIP system, use of Li-Ion batteries in place of Lead-Acid batteries, utilization of non-penetrating vice penetrating periscopes, and optimization of hull structure for shallower operating depths. The analyses and decisions regarding these design features enabled further development of hydrostatic, propulsive, and cost modeling.

The final product represents a feasible solution to Australia's needs; with respect to endurance and mission capability, the CCR will succeed the *Collins* in the 21st century.



¹ *Defending Australia in the Asia Pacific Century: FORCE 2030*. Australian Government: Department of Defence

CCR Key Parameters	
LOA:	84.1m (276.0ft)
Max Beam:	8.4m (27.5ft)
Pressure Hull Length:	63.4m (208.0ft)
Hullform Depth:	15.9m (52.0ft)
Design Depth:	200.0m (656.2ft)
Maximum Depth:	300.0m (984.3ft)
Hull Material:	HY-80
Shaft Horsepower:	5200kW (6970hp)
Designed Submerged Operating Load:	600kW
Armament:	4 Torpedo Tubes
Weapons Loadout	20 Weapons
Submerged Speed:	20 kts
Surfaced Speed:	13.8 kts
Crew:	45
Accommodations:	51
Surfaced Disp:	3548mt (3492LT)
Submerged Disp:	4107mt (4042LT)
Reserve Buoyancy: (% of Sub Disp)	13.6%
Margin Lead:	320mt
Cost (FY10):	AU\$2.9 B

