

Hunter and the hunted: Project SEA 5000 launches GCS franchise

Australia's selection of a derivative of the UK Royal Navy's Type 26 anti-submarine warfare frigate to meet its Future Frigate requirement marks a major success for BAE Systems. **Richard Scott** finds out what is under the skin of the Global Combat Ship – Australia design

On 29 June Australia's National Security Committee selected BAE Systems' Global Combat Ship – Australia (GCS-A) design as the basis for its Project SEA 5000 Future Frigate programme, ending a fiercely fought competition between three of Europe's leading warship builders. A derivative of the Type 26 City-class frigate design developed for the UK Royal Navy (RN), the GCS-A won against the F-5000 design offered by Navantia (itself derived from the Spanish Navy's F-105 frigate and Australia's own Hobart-class Air Warfare Destroyer [AWD]), and an Australian FREMM frigate variant proposed by Fincantieri.

Representing a total investment in the order of AUD35 billion (USD25.5 billion), SEA 5000 will deliver nine frigates – to be known as the Hunter class – to the Royal Australian Navy (RAN) from the late 2020s. The Commonwealth has approved an initial budget of more than AUD6 billion for SEA

5000, covering design activity to incorporate Australian-unique requirements, the prototyping of ship blocks, and long-lead items for the first three ships (to be named HMAS *Hunter*, HMAS *Flinders*, and HMAS *Tasman*). Negotiations with preferred bidder BAE Systems are intended to result in the placing of an initial design and prototyping contract before the end of 2018.

Replacing the eight ANZAC-class frigates, the nine new ships – expected to be delivered in three batches of three – will afford the Australian Defence Force (ADF) an advanced multimission surface combatant optimised for anti-submarine warfare (ASW). This bias reflects the fact that, by 2035, around half of the world's submarines will be operating in the Indo-Pacific region where Australia's interests are most engaged.

Speaking on 29 June, just a week before the end of his tenure as chief of navy, Vice Admiral Tim Barrett characterised the

SEA 5000 decision in favour of GCS-A as a game-changer for the RAN and the ADF. "The replacement of our eight ANZAC-class frigates with nine frigates optimised for anti-submarine warfare ... will significantly enhance the lethality of our surface combatant capabilities," he said, adding, "These ships will incorporate world-class design factors and integrated systems ... that will change the way we conduct anti-submarine warfare operations."

However, the operational environment in the post-2030 period demands that this new surface combatant, whether operating independently or in a national or coalition task group, should be much more than a submarine hunter. When operating with a RAN task group (for example, escorting the landing helicopter dock amphibious element), the Hunter class will contribute to air and surface warfare defence, as well as its primary ASW mission. When acting

BAE Systems' GCS-A design was selected in late June as the basis for Australia's Project SEA 5000 Future Frigate programme.

BAE Systems, 1723613

independently and away from the umbrella protection of more capable air-warfare ships, the new frigate will be reliant upon its own capabilities to protect itself in a hostile air and surface environment.

Accordingly, while GCS-A will leverage the acoustically quiet platform and ASW sensor pedigree of the Type 26, the Hunter class will feature a substantially different above-water combat system based around the Lockheed Martin Aegis combat direction system (being acquired by the Commonwealth under a Foreign Military Sales case), the CEA Technologies' CEAFA2 multi-band phased array radar, and a Saab Australia 9LV-based Australian Tactical Interface. In addition, a number of further modifications are being made to accommodate specific sensor, guided weapons, electronic warfare, and aviation systems mandated by the RAN.

The importance attached to the Future Frigate by the Australian government extends beyond military capability alone. The SEA 5000 programme is also the vehicle by which the Commonwealth intends to sustain and develop its sovereign naval shipbuilding industry into the longer term.

Construction and integration will take place at ASC Shipbuilding in the Osborne Naval Shipyard in South Australia. Currently wholly owned by the Commonwealth, ASC Shipbuilding will become a subsidiary of BAE Systems for the duration of the build programme, a move intended to make BAE Systems fully responsible and accountable for the delivery of the ships.

The Commonwealth will retain a sovereign share in ASC Shipbuilding. The government intends to keep an option to resume complete ownership of ASC Shipbuilding at the end of the programme if required to retain intellectual property, a skilled workforce, and associated plant and equipment.

BAE Systems expects Australian industry content to amount to 65-70% by value. It is estimated that the Hunter-class frigate programme will create significant opportunities for the supply chain nationwide, and more than 500 Australian businesses have already been prequalified to bid for work.

Competitive evaluation

In September 2016, as the Project SEA 5000 Competitive Evaluation Process got under way, most observers ranked BAE Systems running third in the race. With no parent design in the water and the United Kingdom



The GCS-A design is founded on the acoustically quiet platform and ASW sensor pedigree of the Royal Navy's Type 26 City-class frigate.

still to formally commit to Type 26 manufacture, the GCS-A design was labelled as an unproven 'paper ship' by its critics.

Nigel Stewart took up the post as BAE Systems' SEA 5000 managing director at the start of 2017. "Early that year a team from the UK travelled to Australia to review the programme with our Australian company colleagues," he told *Jane's*. "We spent a week looking at options to make a recommendation to the board as to whether we continued the pursuit.

"The assessment was that we had a great ship, which, from talking to the navy and the government, really did fit with their requirement. And there was partial funding for the bid, which was hugely beneficial to all three bidders because we could really start to mobilise resources and quantify programme risk and opportunities."

The team decided it would recommend that the company bid, but also recommend that it find a different way to operate. "We needed to put a global team together where we have [UK] shipbuilding knowledge, and Australian customer knowledge. Let's run it in an integrated way, and work through with the customer the optimum way to contract for the programme," Stewart said. "We took that decision in February 2017, and agreed to proceed on that basis."

The request for tender (RFT) was issued on 31 March 2017, with the bid to be returned in 12 weeks (subsequently extended to 14 weeks after bidders were granted a two-week extension). "So we had to hit the ground running," said Stewart, "but we already had

people working on the bid in Glasgow and Australia. We pretty much co-located the bid team in Glasgow for that period [of RFT preparation]. That was the point that we had finished contracting Type 26 [to the UK Ministry of Defence], so it was logical for us to say if we are going to go for this, then let's go for this properly with a really strong UK/Australian team.

"At that point each of the three bidders was funded for risk reduction and design studies, so the Commonwealth was getting quality deliverables with quality engineering behind it," he added. "The engineering was done in Glasgow, but clearly the Australian content, and how we would work with local suppliers, was undertaken in-country. The final bid physically came together in Scotstoun [Glasgow]."

Following RFT submission in August, the rival bids were scrutinised by the Commonwealth for a six-month period under an Offer Definition and Improvement Activity (ODIA). Out of this came a series of questions and numerous workshops, resulting in resubmissions to clarify parts of the bid.

"The final deliverable for ODIA went in at the end of February," said Stewart. "The government then went through their final evaluations to make their final decision in June."

Stewart continued, "From the initial design contract that we had, which concluded around August [2017], the Commonwealth put in place what it called a schedule protection activity contract, which funded all three bidders to keep mobilising the programme. This meant that momentum on



Royal Australian Navy: 1723622

The UK Royal Navy Type 23 frigate HMS *Sutherland* (nearest camera) and the RAN ANZAC frigate HMAS *Toowoomba* seen during Exercise 'Ocean Explorer' earlier this year. Both these classes will be replaced by Type 26 variants.

Project SEA 5000: understanding Australia's choice

The choice of the Type 26-derived GCS-A to meet the Project SEA 5000 requirement reflects Australia's recognition of its need for an increasingly capable navy at a time of strategic uncertainty, and a determination to use naval shipbuilding as the fulcrum for national renewal of local technological innovation and manufacturing.

The new ship offers a superior ASW platform, and the design intent behind the Global Combat Ship has created a vessel that has much more internal space and flexibility than its competitors. This gives capabilities across the spectrum of conflict. Furthermore, in an age when unmanned vehicles are increasingly important for offensive and defensive operations, the storage volume and working areas provided by the mission bay amidships matter a great deal.

Such design flexibility is even more important because Australia's operational intent for the new Hunter-class frigates has evolved significantly since the start of the project. Rather than purely specialist ASW units, these are to be general-purpose combatants optimised for ASW. This was confirmed in 2017, ahead of ship down-selection, by the government's decision, partly spurred by increasing concern over ballistic missile threats, that the ships should carry the US-developed Aegis combat system. While the Hunter-class frigates are not intended to be air defence command units, which is the role of the new Hobart-class AWDs, they will be capable of making a significant contribution to the anti-air and anti-space battle with Standard Missile-2 (SM-2) and Evolved SeaSparrow missiles, and possibly SM-6 missiles.

The development of Australia's defence industrial base was key to the GCS-A's selection. The BAE Systems proposal, backed by the UK government, clearly offered significant scope for future co-operation.

The future of this industrial relationship will depend

directly upon the extent to which commonality with Type 26 can be maximised while still meeting unique Australian requirements: a complex challenge. The Hunter class will carry the same ASW systems as the Type 26, but the Australian units will otherwise be very different. The relationship between the UK design teams and those in Australia will need to be close to ensure that the Australian ships are produced on time and within budget.

The two countries have been down this path with ASW frigates before: the RAN's River-class destroyer escorts of the 1960s were substantially modified from the British Type 12 Rothesay class on which they were based, carrying different radars and fire-control systems; and the Australian-developed Ikara ASW missile. There are clear risks with the Project SEA 5000 programme, but there are also opportunities for Australia and the United Kingdom.

Arguably, the success of building lines and fulfilment of the intended targets of eight ships for the RN and nine for the RAN depends upon getting everything right from the start. An important associated test for the United Kingdom will be its take-up of Australian-designed and manufactured systems such as the CEAFAR radar. Australia will not be willing to accept a one-way relationship as the United Kingdom seeks to get the maximum possible share of the 35% of the supply chain likely to be available for non-Australian manufacture.

New Zealand may also benefit from the new UK-Australian relationship. The Royal New Zealand Navy is likely to be in the market for replacements for its two ANZAC frigates, and a tailored GCS variant would appear attractive in terms of capability and interoperability.

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design activity and mobilisation in Australia could be maintained, and means we already have a team of 120 people up and running on the programme. That makes it so much easier to go forward and was an excellent way of de-risking the programme."

Turning the tide

Having been judged an outsider at the start of the SEA 5000 competition, BAE Systems sought to change perceptions by highlighting its ASW capability and its local connection. "Our campaign was centred on three key messages," said Stewart. "First, we had the best capability in Type 26. ... It is specifically designed for ASW, and it is the most acoustically quiet ship thanks to the UK's investment in the hullform and [Combined Diesel Electric or Gas] machinery package. I think that from a capability perspective we were always confident that we were ahead.

"Second was our Australian heritage and the fact that we are an Australian company with a turnover of about AUD1 billion. We've been in Australia for 65 years, we built the ANZACs at Williamstown, and we've been a big part of the ANZAC upgrade.

"And the third one was based around the 'Five Eyes' relationship on security and information sharing. We have enjoyed huge support from the UK government and the Royal Navy as well as our key supply chain partners," he said.

Part of the wider UK campaign was the deployment of the Type 23 ASW frigate HMS *Sutherland* to Australia in early 2018. "*Sutherland's* visit, and participation in Exercise 'Ocean Explorer' off the east coast, was important in demonstrating the performance of Sonar 2087 [the same active/passive low frequency variable depth sonar equipping Type 26 and now baselined for GCS-A]," said Stewart. "It showed how quiet the ship was, and its ability to detect submarines at range."

The Type 26 was "designed from the keel upwards to be an exceptionally quiet sub-hunter, but it's more than that. It will have strike-length Mk 41 launchers offering the potential for strike, good anti-air warfare capability, and a mission bay to afford flexibility and adaptability," Stewart said. "The ship has also been designed with space, weight, and power margins to allow the ship to grow through-life."

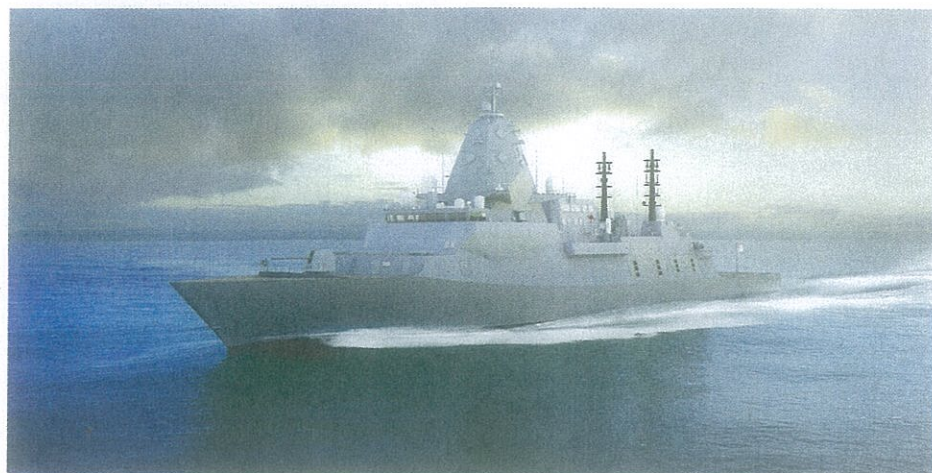
As an adaptation of the Type 26 tailored for the SEA 5000 requirement, the GCS-A is characterised as an Australianised military

off-the-shelf solution. It integrates into an existing platform design an Australian-specific combat system – combining the ship's navigation systems, internal and external communications systems, and various sensors and weapons capabilities with associated computer network, integrated by the combat management system.

The combat system represents the most complex physical integration into the platform, and the area where the differences between GCS-A and the 'parent' Type 26 design are most apparent. The most obvious is the CEAFAR2 radar, which requires an enlarged mast structure, and the introduction of a fourth Mk 41 vertical-launch silo (bringing capacity up to 32 cells).

However, the intention is that the platform up to the flight deck level stays essentially the same, with no changes to the propulsion systems or platform equipment. This aligns with the Commonwealth's objective to minimise change and maximise commonality.

"What the modularity [built into Type 26] gives us is a highly flexible design that enables adaptation to accommodate a range



BAE Systems: 173617

The GCS-A incorporates an Australian-specific integrated combat system. Key changes include the CEAFAR2 radar (requiring a new mast structure), the Lockheed Martin Aegis CMS/Saab Australian Tactical Interface, an additional Mk 41 silo, provisions for an MH-60R helicopter, and integration of the Nulka active missile decoy.

of different combat system configurations on the same common platform," said Stewart. "Our UK engineering team is now coming off the peak as Type 26 moves into production, and that gives us the bandwidth to

support the modifications necessary for SEA 5000," Stewart said.

SEA 5000 competitors had naturally pushed the line that GCS-A was a 'paper ship'. "It was hard to defend that when we didn't

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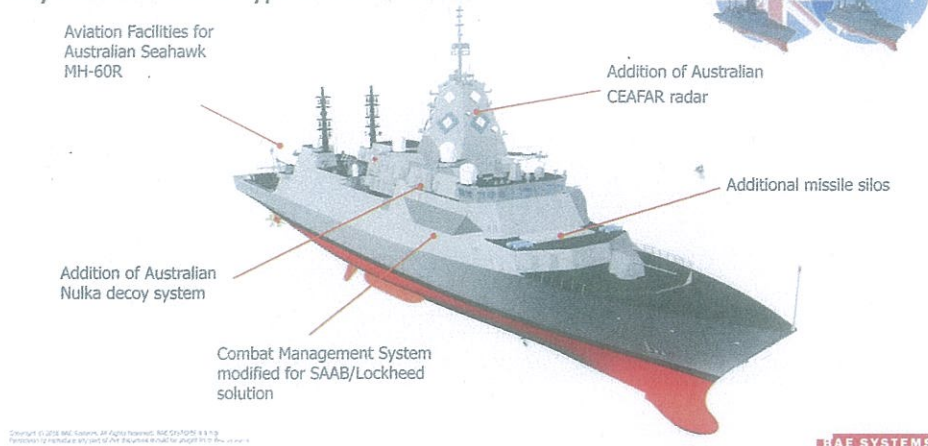
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Key modifications of Type 26 for SEA 5000



The GCS-A, an adaptation of the Type 26 tailored for the SEA 5000 requirement, was developed to meet the criteria of an Australianised military off-the-shelf solution.

BAE Systems: 1723616

have a contract and we had not cut steel, Stewart acknowledged. "But getting under contract [in the United Kingdom] and cutting steel in June 2017 was a game-changer.

"Then there was the argument that we hadn't proven the design. But if you look at it, Australia is running five years behind the UK. We start prototyping in 2020, and that's two years to prove the new facility and build some prototype blocks and test manufacturing systems. Full production starts at the end of 2022.

"So we have a five-year gap between the UK and Australian programmes. In fact we will have cut steel on three Type 26s in the UK before production of the first Hunter-class ship for the RAN begins. That five-year period allows for de-risking in the UK, and still gives Australia the benefits of no obsolescence in the supply chain, with live engineering and programme teams up

Project SEA 5000 requirements development

Australia's need for a new class of frigates was first identified in the 2009 Defence White Paper (DWP), which noted the need for "eight new, larger frigates optimised for anti-submarine warfare, to replace the eight ANZAC frigates". The Defence Capability Plan published that same year said that Project SEA 5000 would introduce into service "the next generation of naval surface combatants that will have a strong emphasis on anti-submarine warfare and be capable of independent and task group operations".

The Australian Department of Defence decided early on to continue investment in the indigenous CEAFAR phased array radar technology – already being introduced to the ANZAC frigates under the Project SEA 1448 Anti-Ship Missile Defence upgrade – to meet the needs of the Future Frigate. Accordingly, Project SEA 5000 Phase 1A funded engineering development and demonstration activities for the CEAFAR2 radar in the S-, X-, and L-bands.

DWP 2013, presented in May that year, reaffirmed the need for the Future Frigate. At the same time, the White Paper noted that decisions on major surface combatants would need to "balance carefully the capability, resource, workforce, and industry factors, as well as potential implications for competing funding priorities".

Initial Pass approval for Project SEA 5000, achieved in June 2014, released funding to study the Future Frigate's requirements, from platform systems and warfare requirements through to sustainment requirements and integration of the class into the ADF and allied environments. At that time, with the cost

and schedule overruns impacting on the three-ship Hobart-class Air Warfare Destroyer (AWD) programme very much in mind, the key priority was to ensure a sound foundation for a continued naval shipbuilding enterprise in Australia that could achieve an acceptable benchmark for productivity and cost.

In line with this objective, the Commonwealth explored options for the continued build of the AWD hull, but with the design adapted for a primary ASW role, and the combat system reconfigured around the Saab 9LV combat management system (CMS) and the CEA Technologies CEAFAR2 phased array radar. Consistent with these objectives, the Department of Defence awarded CEA Technologies, Saab Australia, and Navantia (as design agent for the AWD programme) in late 2014 risk reduction engineering study contracts to jointly investigate a Future Frigate concept based on the Hobart-class AWD platform, but adapted to host an 'indigenous' combat system based on the 9LV CMS (integrating with the Aegis Fire Control Loop) and the CEAFAR2 radar suite.

April 2015 saw the publication of a wide-ranging review into the Australian naval shipbuilding industry, prepared by the RAND Corporation. Commissioned in September 2014, the report provided a series of recommendations as to the reform and long-term sustainability of the industrial base.

Key to this, according to RAND, was implementing a carefully managed continuous shipbuilding strategy. Other recommendations included establishing a consistent production and build demand; selecting a mature design at the start of the build; ensuring a well-

integrated designer, builder, and supplier team; and matching the industrial base structure to demand.

Reflecting the findings of the RAND study, the Australian government in August 2015 unveiled a long-term, continuous shipbuilding plan. Attendant to this was the acceleration of Project SEA 5000 by two years, and bringing forward construction of a new class of offshore patrol vessel (Project SEA 1180).

DWP 2016, published in March that year, outlined plans for a 12-strong major surface combatant force comprising the three Hobart-class AWDs and nine ASW-optimised Future Frigates (up from the earlier planning assumption of eight ships).

Project SEA 5000 received First Pass approval from government in April 2016. In parallel, it was announced that BAE Systems, Fincantieri, and Navantia had been shortlisted to refine their respective reference ship designs.

The RFT, as part of the Competitive Evaluation Process for the SEA 5000 Phase 1 project, was promulgated in March 2017. This outlined five key objectives: to deliver nine ASW ships based on a military off-the-shelf design with minimum change; to contribute to a continuous naval shipbuilding industry in Australia; to maximise Australian industry capability; to commence construction in Adelaide in 2020; and to establish acceptable commercial arrangements to achieve overall value for money for the Commonwealth.

In October 2017 the government announced that the SEA 5000 combat system would be based on the Aegis CMS, together with an Australian Tactical Interface developed by Saab Australia.

and running, and we can bring Australian recruits to Glasgow for training.”

Allied to this and also intrinsic to the bid, was BAE Systems’ concept of a ‘digital shipyard’. “What we have developed for the Type 26 in the UK is an entire digital ship design, including parts catalogues and bill of materials, all hosted in one digital database,” said Stewart. “What we want to do is to mirror the major parts of that IT system from Glasgow to Adelaide. That will allow us to flow information seamlessly, and permits shared working in real time using one dataset.”

Stewart added, “This is an unprecedented transfer of intellectual property. ... With this knowledge, Australian industry will gain the know-how needed to both build and optimise the ship over its life, potentially improving its flexibility and performance with bespoke local innovation and technology. We want to ensure that Australia can support the development of a continuous naval shipbuilding capability.

“Remember that outset of SEA 5000, the prime aim of the competition was not about building nine frigates. It was to lay out the plan for continuous naval shipbuilding, of which the first piece of that jigsaw was to build the Future Frigate.”

Production is anticipated to run at a 24-month ‘drumbeat’ that, from a production resource point of view, gives BAE Systems visibility out to the mid-2040s. Moreover, it provides foundations on which to build the enterprise over the longer term.

“Australia is investing in a AUD35 billion programme,” Stewart said. “Rather than all that investment disappearing offshore, the aim is to make sure that, in say 20 years’ time, the Commonwealth has a truly sovereign capability to be able to design and build ships independently, as opposed to be able to assemble ships but still relying on European shipyards for the design.”

Australian industry involvement will also be key. “SEA 5000 is great news for UK companies like Rolls-Royce [supplier of the MT30 gas turbine], David Brown [gearbox], Thales [Sonar 2087], and Ultra [Sonar 2150]. But what they are doing is looking for in-country partners ... so for example, Rolls-Royce has already selected a subcontract partner to build all the enclosures in Australia.”

The management of combat systems integration is still being worked through. The intention at this stage is that BAE Systems will lead the combat system integration task,

Global Combat Ship – Australia main particulars

Length	149.9 m
Beam	20.8 m
Displacement	c 8,800 tonnes (full load)
Propulsion	Combined Diesel Electric or Gas (CODLOG) 4×3 MW high speed MTU diesel generators 1×36 MW Rolls-Royce MT30 gas turbine (boost) 2 × electric motors 2 × fixed pitch propellers
Speed	27+ kt
Range	>7,000 n miles at cruising speed
Accommodation	c 180 crew including embarked flight, with accommodation and services for up to 208
Warfare systems	Aegis combat management system with Australian Tactical Interface CEAFAR2 S/X/L band phased array radar suite Mk 41 vertical launch system (4×8 cells) for SM-2 and ESSM missiles Sonar 2087 low frequency variable depth sonar Sonar 2150 medium frequency hull-mounted sonar Electro-optical sensors Electronic warfare system Mk 45 Mod 4 127 mm medium-calibre gun 2 × Phalanx Block 1B 20 mm Close in Weapons Systems 2×30 mm short-range gun MU90 lightweight torpedoes Anti-ship missiles (TBD) Nulka active missile decoy system
Aviation	1 × MH-60R helicopter
Mission bay	Can store additional helicopter or unmanned systems

Source: BAE Systems/Australian Department of Defence

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but working together with a ‘rainbow’ team – also including Lockheed Martin, Raytheon Australia, and Saab – to capitalise on extant skills and experience from AWD and the ANZAC upgrade.

Next steps

Following the announcement of selection as preferred bidder, BAE Systems is now engaged across a number of work streams. “We have now started negotiations on the initial design contract,” Stewart said. “Our aim is to get the contract signed before the end of the year.

“Secondly, we’re going through due diligence on ASC. We have to understand how we acquire the company, transfer the workforce, and how we ensure we keep AWD and OPV progressing with no delays caused by the transfer. Our joint goal is to finalise the ASC transaction ahead of contract signature.

“The third strand is to carry on with the critical path of mobilising the programme. So we are now beginning to ramp up further on the resources side – the engineering carries on, we’re starting the process to bring in the supply chain and get suppliers under

contract, at least for design, where we need them immediately.”

Stewart said there would also need to be investment to ensure BAE Systems achieves its Australian content commitments. “One of the things we also built into our bid, was to allocate funding so we can build business cases to allow further investment, subject to Commonwealth approval, in Australian capability to increase further the sovereign capability in the supply chain,” he said.

“This means there are options which may not necessarily pay back over three, four, or five ships, but will pay back over eight or nine ships or over the long term.” ■

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Comment

The selection of the Type 26-derived GCS-A for Project SEA 5000 marks a significant success for BAE Systems, and the first time in more than 50 years that Australia has selected a UK-designed surface combatant. Another variant of the GCS, bid by a Lockheed Martin Canada-led team, is being considered for the Canadian Surface Combatant programme.