

# Collaborative team advances Successor submarine concept work

Initial outputs from concept phase activities exploring options for the UK's Successor nuclear-powered ballistic missile submarine are being delivered to the Ministry of Defence's (MoD's) Future Submarines Integrated Project Team (FSM IPT).

**I**ntended to replace the UK Royal Navy's four existing Vanguard class SSBNs from 2024, the Successor submarine is currently the subject of a two-year concept phase activity due to complete in September 2009 for Initial Gate submission.

Work is being undertaken by a collaborative team from the MoD, BAE Systems Submarine Solutions, Babcock Marine, and Rolls-Royce at the FSM IPT's satellite project office at BAE Systems' Barrow-in-Furness shipyard in northwest England.

The UK government outlined its plans in a December 2006 White Paper to maintain

and renew its strategic nuclear deterrent capability by building a new class of SSBNs and buying into the US Trident D5 missile life-extension programme. These plans were endorsed by parliament in March 2007.

The vote allowed the MoD to formally sanction concept design activities for a successor submarine to replace the four Vanguard class SSBNs. A class of three or four Successor boats is planned. Current plans are for the concept phase to be followed by a seven-year design phase, a seven-year build phase, and a period of sea trials before the first boat enters service in 2024.

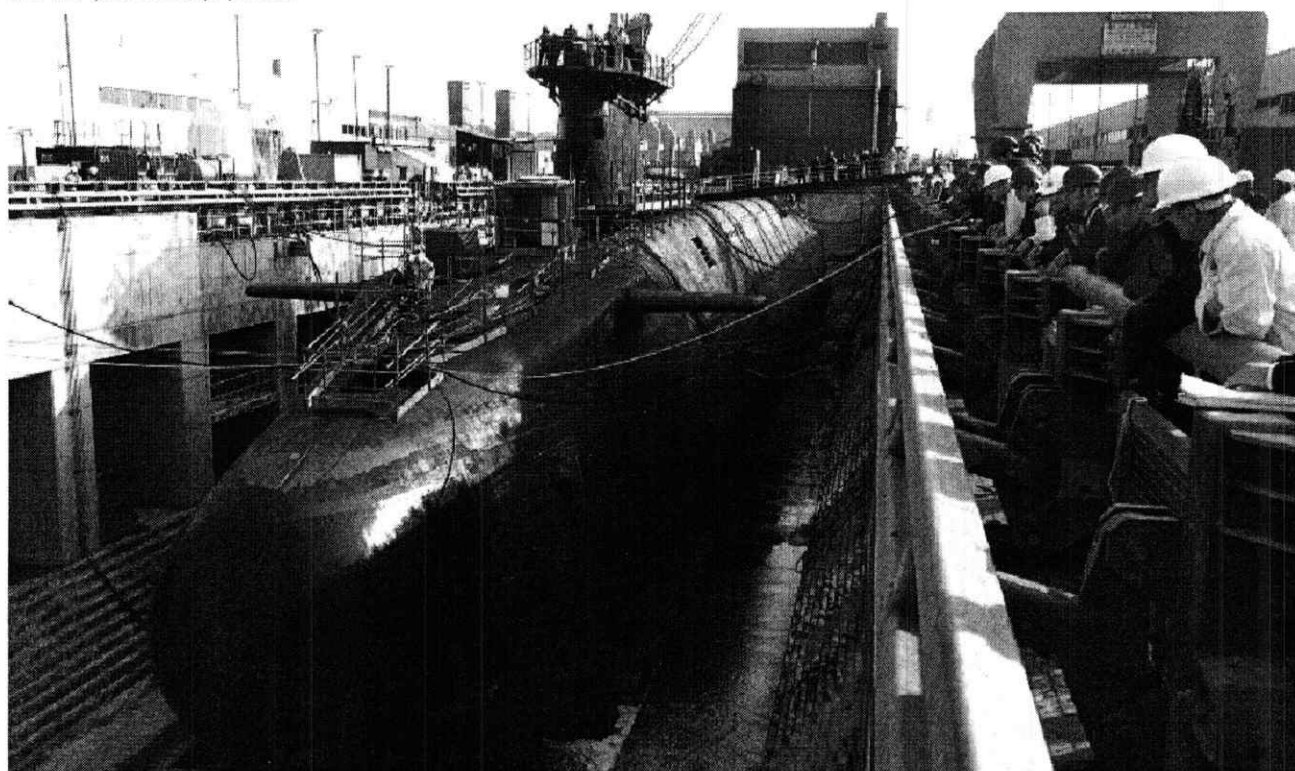
According to the MoD, it is developing a

collaborative agreement with its three key industrial participants, BAE Submarine Solutions, Rolls-Royce, and Babcock Marine, to deliver the concept design for the new class of submarines optimised for through-life delivery.

'This agreement will sit above the three individual service contracts with each of the industrial participants,' it says, adding: 'The commercial structure links MoD and its three tier one industry providers together to enable collaborative working practices.'

At present the FSM IPT is working together with these companies to agree the Service Contracts and collaborative

Intended to replace the UK Royal Navy's Vanguard class SSBNs (shown here) from 2024, the Successor submarine is currently the subject of a two-year concept phase.



agreement. These should be signed shortly. Concept phase activities have been split into two parts. The first has concentrated on what form the major system functions will take, including propulsion, combat systems, and strategic weapon systems.

Informed by these outputs and their attendant option sets, a second phase of concept work is now seeking to develop a coherent and costed submarine design that will meet the overall requirement, and meet affordability criteria (both in terms of unit production cost and whole life cost).

According to BAE Systems Submarine Solutions, deliverables for the concept phase include '21 papers setting out the strategy for specific systems and major equipment in the design, 19 addressing specific aspects of the whole boat design, [and] 11 detailing the design process strategies.'

BAE Systems adds that the joint project team has now developed and delivered 'an early version of the client's design strategy papers that must be delivered at the end of the concept design phase'. It continues:

'The team has also produced a technology strategy. This covers how alternative technologies will be identified and introduced into the submarine design in a controlled way to contribute to achieving an affordable programme, both in terms of unit production cost and whole life costs.'

The concept design process will see quarterly reviews to ensure the concept design is being developed in line with the MoD's requirements. The first of these, conducted in December 2007, considered the initial configuration of the Successor submarine design.

To support delivery of the programme the FSM IPT requires independent and impartial expert technical support to provide assurance and confidence in the technical activities underpinning an effective concept design. Following competition, a team of QinetiQ, BMT Defence Services, and Deloitte has been contracted as client adviser (technical) to support the programme, its tasks covering the full range of concept phase outputs, concurrent with

the design team activities.

This so-called 'QBD' consortium is providing technical advice in a range of specific disciplines including safety advice and hazard management, whole boat design, requirements and acceptance, product/technology assessment and integration, systems concepts, and design management.

In a further development, BAE Systems Submarine Solutions and Rolls-Royce have signed a statement of strategic intent setting out a collaborative framework to deliver the propulsion element of the Successor programme.

Rolls-Royce, as design authority for all Royal Navy nuclear steam raising plants, is undertaking concept phase studies for a next generation nuclear propulsion plant (NGNPP) for the new SSBNs and the projected follow-on maritime underwater future capability.

The primary drivers for NGNPP are a simpler and intrinsically safer design, and less onerous demands on shore facilities. *WT*

## AUTOCHARGE AUTOMATED CYLINDER FILLING SYSTEMS

### For Diving Air and Fire-Fighting Breathing Air Cylinder Charging On-board Ship

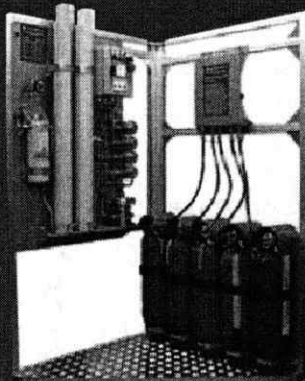
Imagine taking uncertainty out of an unfamiliar task, the end result of which may save lives. Filling breathing air cylinders is a time consuming, manual process, not without risk and often with a variable outcome in terms of the mass of gas filled... **Until now**

Applied Industrial control and sensor technology – allows:

- ▶ Repeatable, maximised & consistent mass of gas filled
- ▶ Cylinder filling times as fast as 90 seconds
- ▶ Temperature effects to be fully controlled
- ▶ Different pressures for different applications e.g. 300 bar for breathing air 200 bar for diving air
- ▶ Multiple cylinder filling from one panel
- ▶ Cylinder filling from any residual pressure e.g. 0 to 380 bar (5,510 psi)
- ▶ Control of breathing air quality to recognised standards
- ▶ Real time on-line monitoring option

Automation – means:

- ▶ Ease of operation
- ▶ Risks inherent with manual control are removed
- ▶ Safe control of high pressure air
- ▶ Reduces the need for skilled operatives
- ▶ Reduced training requirement
- ▶ Less time is spent filling and re-filling cylinders
- ▶ More time to do other jobs while cylinders fill



Track record – proven technology:

- ▶ >1,000,000 hours in-service
- ▶ Proven in complex industrial applications
- ▶ Fitted to UK's Helicopter Carrier HMS Ocean
- ▶ Supplied for all 6 of UK's latest T45 Destroyers
- ▶ Specified on UK's next generation Aircraft Carriers
- ▶ 60 years experience in breathing & diving air systems
- ▶ Guaranteed through-life support

Simple, yet robust design:

- ▶ Push button operation to start, stop and vent down
- ▶ Clear indication of filling in progress
- ▶ Emergency stop
- ▶ Shock & vibration tested
- ▶ Constructed in materials to withstand marine environment
- ▶ Modular design to fit in to any available space
- ▶ Modular design allows single or multiple filling outlets



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