



Ministry
of Defence

The United Kingdom's
Future Nuclear Deterrent:
2013 Update to Parliament



Introduction

In March 2007, Parliament voted to support the Government's plan to renew the UK's independent strategic nuclear deterrent through the replacement of the four Vanguard Class Ballistic Missile Submarines (SSBN), with a class of new 'Successor' SSBNs. This is the second in a series of annual reports which explain the progress the MOD has made on the programme over the last year and sets out the plans for the coming year.

The Successor design and build programme is amongst the most complex ever undertaken by British industry. The new design of submarine being developed jointly by the Ministry of Defence and its three industrial partners – BAE Systems (BAES), Rolls-Royce and Babcock International - will exploit much of the most modern mechanical, electrical and nuclear technologies, and employ a significant portion of the UK's engineers, project managers and technicians.

Following early concept phase work, the MOD announced on 18 May 2011 the commencement of a five year long, £3Bn Assessment Phase, the main purpose of which is to refine the design of the submarine and capture the associated costs in order to make a "Main Gate" investment decision in 2016. Subject to this decision in 2016, the Successor Submarine platform is expected to cost £11-14Bn (at 2006 prices), employ a minimum of 3,500 people, peaking at 6,000 during the build phase from 2016 to the late 2020s, and involve over 850 British companies in the supply chain.

Background

In December 2006, the Government published a White Paper: "The Future of the United Kingdom's Nuclear Deterrent", which set out the conclusions of studies into whether the United Kingdom still required a nuclear deterrent and, if so, how that nuclear deterrent might best be delivered. The White Paper assessed that, although at the time there was no nation which had both the capability and the intent to threaten the independence or integrity of the UK, we could not dismiss the possibility of a major direct nuclear threat to the UK re-emerging despite our work to counter nuclear proliferation. The White Paper also concluded that, of the potential ways to deliver a nuclear deterrent capability, the most effective system was a further class of submarines carrying ballistic missiles. In March 2007, a Parliamentary vote endorsed the conclusions of the White Paper.

Following this Parliamentary endorsement, the MOD began to assess the options to determine how best to deliver a new class of SSBN, within the declared cost envelope, that would meet the demanding technical and operational requirements, to maintain a credible deterrent capability well into the second half of this century. In 2010, the Coalition Government confirmed its commitment to proceed with the Successor programme, maintaining the deterrent at the level judged necessary to deter a major nuclear threat to the UK in the event that one re-emerges in the future. The Trident value for money review identified savings of approximately £1.2Bn, and deferred spending of up to £2Bn.

A decision on the number of submarines needed to maintain continuous at sea deterrent patrols will be made at the end of the Main Gate Assessment Phase, when we will have the necessary information on the maintenance requirements of the new submarine design.

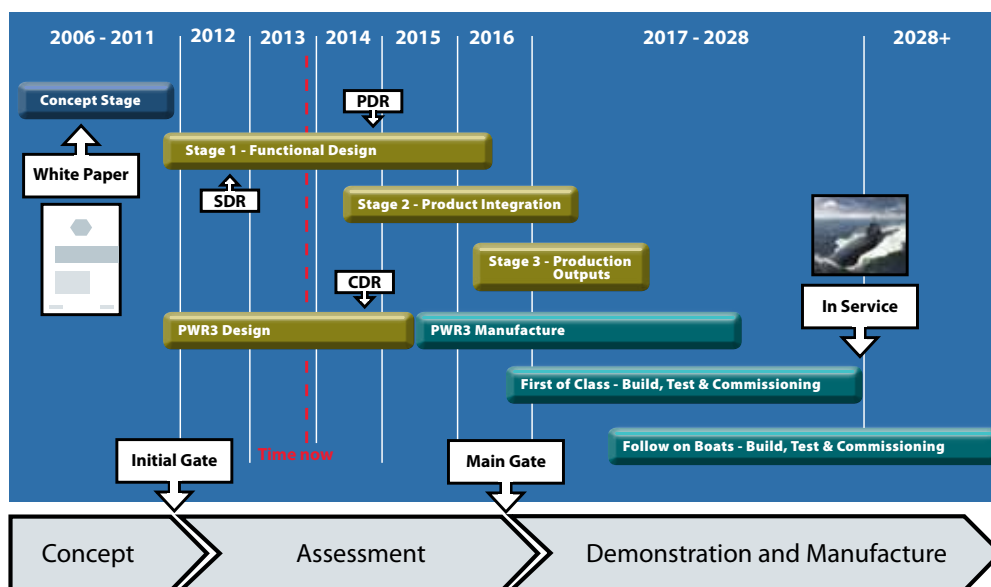
The Concept Phase work culminated in a recommendation to develop a submarine design based on a new nuclear propulsion system (known as Pressurised Water Reactor 3 (PWR3)) with a Common Missile Compartment (CMC) to be developed jointly with the United States (US). It was also recommended that the MOD should proceed with a five year long, £3Bn Assessment Phase during which the design would be refined, preparations made for the build programme, and the essential long lead items ordered.

In May 2011, the then Defence Secretary announced the Government’s decision to accept these recommendations and to commence the Assessment Phase. A report, “The United Kingdom’s Future Nuclear Deterrent: The Submarine Initial Gate Parliamentary Report” was published at the same time, outlining the MOD’s plans for the Assessment Phase.

On 16 July 2013 the Government published the Trident Alternatives Review, a Cabinet Office led study into alternative deterrent systems and postures. The Review demonstrated that no alternative system is as capable, nor as cost effective, as a Trident-based deterrent. The Government policy remains to maintain a continuous at sea deterrent and proceed with the programme to build a new fleet of ballistic missile submarines.

Programme Overview and Progress Since Last Report

The objectives of the Assessment Phase are to: refine the design of the Successor submarine; develop detailed cost estimates; and develop a procurement strategy such that the main investment decision can be made in 2016 with confidence that the boats can be built in the timescale required, to meet the essential requirements, and within the available budget. Whilst the Assessment Phase is being led by the MOD, it is being conducted by a highly integrated team comprising MOD employees and staff from the three industrial partners: BAES, Rolls-Royce and Babcock International.



At Initial Gate, a set of Key User Requirements was approved and these have been used as the basis for defining the "Ship Specification". Against this overall specification, the first phase of the detailed design has been to develop comprehensive definitions for each of the submarine systems. This process drew on lessons from, and was significantly in advance of, similar activities in previous UK submarine construction projects.

The next stage in the Assessment Phase design activity is to develop the functional designs of each of the individual systems – of which there are some 200 – and populate the designs with detail such that prospective suppliers can be engaged with detailed specifications for major components.

The programme remains on schedule to be sufficiently mature in terms of design and cost estimates for a Main Gain investment decision in 2016. Experience has demonstrated that making significant investment decisions and placing contracts when projects are not sufficiently mature leads to cost growth and time delays.

Programme Management

A collaborative approach to managing the programme has been adopted to maximise the capability of the UK submarine enterprise, drawing upon lessons from successful collaboratively-managed major programmes such as the Olympics. The Integrated Programme Management Team brings together representatives of MOD and its three industrial partners at Leadership, Management and Support levels to manage the integration of constituent elements of the programme.

The programme schedule is driven through the use of an Integrated Master Schedule which ensures that all parties engaged in the Successor programme are working to a single schedule, and interdependencies are managed effectively.

Build, Test and Commissioning Strategies

Over the last year, further progress has been made in refining the build strategy for the Successor programme. Lessons learned from the Astute programme and comparable US programmes have been utilised. The project aims to deliver an optimum level of design maturity at the start of build and detailed analysis of the planned build schedule is enabling effective management of potential complexities.

In parallel with design and production planning activity, the submarine's safety case is being developed as a fully integrated element of the design. The Successor submarine represents a major step forward in integrating safety into the submarine design process, and the Safety Case will demonstrate that the submarine meets extremely stringent safety requirements. This work both analyses and informs the design leading to a high level of confidence in the safety of the submarine.

International Collaboration

Collaboration with the US is being maintained to the mutual advantage of both nations, specifically in the areas of nuclear propulsion and the strategic weapon system (Trident missile, missile compartment, and associated navigation and computer systems). The MOD has this year agreed the strategy for procuring and building the Common Missile Compartment - a design which will be common to both Successor and the US Ohio Replacement SSBNs - which means that the UK will build the Missile Compartment in the UK with outfitted missile tubes supplied pre-constructed from the 'Electric Boat' division of the General Dynamics company in the US. The prototyping programme is underway and the manufacture of four prototype forgings for the upper tubes has commenced. Engineers and manufacturers in the UK are currently proving their ability to produce the highly complex shape meeting required tolerances in a controlled and repeatable process, a key element to de-risking the missile tube programme.

Employment

As the scale of the programme grows, so does the number of people employed. The total number of MOD, BAES, Rolls Royce and Babcock International employees currently working on the programme is in the region of 2,000 with more than 50% working as engineers and designers. Demand for skilled workers will continue to grow as the programme progresses into build reaching a peak in the production phase of some 6,000 people.

Supply Chain

As the design of the submarine matures, the MOD and Industrial Partners are able to engage with potential equipment suppliers in order to develop more detailed cost estimates. Work done to date has identified over 850 potential UK Suppliers spread across the country. This underlines the fact that the deterrent is a national endeavour, drawing on cutting edge design and engineering skills available in the UK, providing employment opportunities and development prospects for apprentices, trainees and graduates, as the programme matures.

Skills and Technology

The Successor submarine is designed to be one of the stealthiest submarines in the world during its operational service from the late 2020s to 2060s. It will also be the largest, safest and most technically advanced submarine ever built in the UK, requiring step changes in manufacturing processes and practices.

Despite these advances, Successor will be built in a shorter period than that taken for the much smaller Astute class boats. To meet these aims, a number of world beating new and adapted technologies are in use and/or planned in both the later Astute and Successor programmes. The range and scale of innovation in production and other disciplines is being carefully managed to provide clear and deliverable benefits to schedule and cost performance without introducing unwarranted additional risk to the production process. One of the major innovations in Successor is the design and integration of the innovative PWR3 reactor. There is an extensive engineering and development programme under way to prove the efficiency and safety of the design, including construction and operation of highly advanced test rigs.

Submarine Costs

Expenditure to the end of the financial year 12/13 amounted to £415M, bringing the overall sum spent on the Assessment Phase to £730M, which is in line with plans set out in the Initial Gate Business Case. The forecast cost to Assessment Phase completion remains within the £3Bn envelope approved in April 2011.

As highlighted in the Initial Gate Parliamentary Report, working with the Industry Partners under the Submarine Enterprise Performance Programme (SEPP) to deliver business improvements and financial savings across the submarine enterprise remains key to delivering the Successor programme to the agreed performance, cost and time. SEPP expects to deliver savings of at least £900M by 2020/21, of which Successor's share is some £220M. By the end of the last financial year, a total of £107M of savings had been identified and removed from the initial Successor costing and a range of candidate measures to deliver the remaining £113M had been identified and are currently being matured.

As part of SEPP, the MOD, in February this year, awarded Rolls Royce an £800M foundation contract to facilitate the company's transformation of its operations to carry out work at best value for the taxpayer. By consolidating costs into one contract, MOD and Rolls-Royce expect to make savings of around £200M over the next decade. A contract was also signed as part of SEPP, in July this year, with BAES to target £380M of savings over the next eight years. This will ensure the Royal Navy's submarine capability is delivered more efficiently, providing good value for money for the taxpayer.

Long Lead Items

As noted in the Initial Gate Parliamentary Report in 2011, it is necessary to procure some long lead items in advance of the Main Gate decision in 2016, to ensure their availability during the build process. Within the £533M approved for long lead items at Initial Gate, a number of commitments have been made. These include: £52M on elements of nuclear propulsion; £31M on missile tube long lead items, through the US; and long lead contracts we have recently placed with BAES, valued at £79M, for items including castings and forgings, structural fittings, electrical equipment and secondary propulsion equipment.

Wider Deterrent Programme

Although the most obvious part of the Future Nuclear Deterrent, the submarines comprise just one part of the capability. Other aspects include the missile and warhead, and the infrastructure required to directly support the submarines, provide specialist submarine training, and ensure the secure and assured communications to the on-patrol submarine. The 2006 White Paper¹ recognised that £2-3Bn (at 2006 economic conditions) would be required for the supporting infrastructure including the Command and Control of the Nuclear Firing Chain and a further £2-3Bn for a replacement warhead.

Infrastructure

The infrastructure required to support the Future Deterrent capability remains on track to be delivered on time, to the required capability and at minimum cost. The infrastructure programme Concept Phase will be delivered incrementally to realise cost and risk reduction opportunities.

Given the extensive investment in new facilities undertaken in the early 1990s to support the Vanguard Class submarines as they entered service, the Assessment Phase activities completed to date continue to support the assumptions set out in the White Paper that no new significant infrastructure will be required to support the Successor submarines. Investment is forecast to be limited to the modification of existing infrastructure to accommodate the differences between the Vanguard and Successor designs. Wherever possible, opportunities are being taken to integrate the delivery of the limited Successor driven changes into existing defence projects; this should minimise the investment required and ensure continued availability of infrastructure in support of operational submarines. Assessment studies to inform options for the delivery of any Successor related training and accommodation infrastructure are planned to complete in 2014.

¹ The Future of the United Kingdom's Nuclear Deterrent, Cm 6994, December 2006

Warhead

The 2010 Strategic Defence and Security Review determined that a replacement warhead would not be required until at least the late 2030s, meaning a decision to replace the existing warhead will not be required until the next Parliament. Studies are under way to inform this decision. In the meantime, we are maintaining the capability at the Atomic Weapons Establishment to design a replacement warhead should that be required. Current forecasts indicate that the design, development and production of a future warhead should remain within the 2006 White Paper estimate of £2-3Bn (at 2006 economic conditions).

Future Work

Over the next year, the programme will continue to evolve as the submarine design matures, together with further commitments to long lead items (within the £3Bn Assessment Phase approval). Detailed preparations will also continue for Main Gate in 2016, ensuring that the design, costings and procurement strategy are sufficiently mature. At the submarine construction yard in Barrow-in-Furness, following a detailed review of the build facilities, a programme of civil works has been prepared to provide capacity to accommodate the larger Successor submarine (when compared with the Astute or Vanguard Classes), and to enable the adoption of much-improved production techniques. The preliminary infrastructure design will commence in late 2013 with construction starting some 12 months later.

A further report to Parliament will be made in 2014.

