



Ministry  
of Defence

The United Kingdom's  
Future Nuclear Deterrent:  
**2012 Update to Parliament**



# Introduction

On the 18 May 2011, the Ministry of Defence (MOD) announced that the first milestone (known as Initial Gate) for the Successor deterrent submarine programme had been passed and that a five year-long, £3Bn Assessment Phase had been approved. The main purpose of the Assessment Phase is to refine the design of the successor submarine prior to the main investment decision (known as Main Gate), which will be taken in 2016. This is the first of a series of annual reports that will explain the progress the MOD has made on this programme and set out what is expected to be achieved over the coming year.

## Background

In December 2006, the previous 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 concluded that, whilst at the time there was no nation with both the capability and intent to threaten the independence or integrity of the UK, we could not dismiss the possibility that a major direct nuclear threat to the UK might re-emerge despite our work to counter nuclear proliferation. The White Paper also concluded that, of the potential ways of delivering 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. In 2010, the Strategic Defence and Security Review reaffirmed the Government's commitment to a minimum effective nuclear deterrent, including reducing the number of operational missiles carried onboard each submarine and reducing the number of warheads carried to 40.

Following the 2007 Parliamentary endorsement, the MOD began work to assess different options to determine how best to deliver an affordable ballistic missile submarine that met a demanding set of technical and operational requirements and which was capable of maintaining a credible deterrent capability well into the second half of this century.

This work culminated in the Successor Initial Gate Business Case and the recommendation that the MOD develop a design based on a new nuclear propulsion system (known as Pressurised Water Reactor (PWR) 3) and a missile compartment that would be jointly developed with the United States (US)<sup>1</sup>. It was also recommended that the MOD proceed with a 5 year long, £3Bn Assessment Phase during which the design would be refined, preparations would be made for the build programme, and long lead items ordered.

In April 2011, the Chief Secretary to the Treasury approved the Initial Gate decision, and this was announced to Parliament in May 2011. A report "The United Kingdom's Future Nuclear Deterrent: The Submarine Initial Gate Parliamentary Report" was published at the same time, explaining Initial Gate decisions and setting out the MOD's plans for the Assessment Phase.

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<sup>1</sup> The US and UK agreed in 2008 to design and develop a Common Missile Compartment, on a cost sharing basis, for the submarines that will replace the Vanguard and US Ohio classes. This will ensure compatibility with the US-supplied Trident D5 missiles, ensure commonality of each nation's launching systems, and will help minimise the production and support costs for the UK programme.

# Progress since Initial Gate

Submarine design is a complex activity involving not only the overall hull but also a series of stages for each individual component. There are many thousands of subsystems and components which will need to work together in the final, detailed design. In simple terms, the first stage is to decide and understand the actual specifications of each system and component, for example the high pressure air system that will surface the submarine. The main outputs from this process are the system drawings and the technical specifications required for the purchase of equipment provided by companies outside the three Industrial Partners (BAE Systems, Rolls-Royce and Babcock Marine). Production of these specifications will continue into next year and beyond, reflecting the different lead times of the equipment concerned. The second stage of the design process considers how these various sub-systems and components will be incorporated into the overall Submarine design. In the third and final stage, the detailed technical drawings are produced, building on the work of the previous two stages. These drawings are then finalised and issued to allow the build of the submarine to proceed.

The focus since Initial Gate has been on Stage One work and this is about a third completed, with the first wave of task packages completed. A number of studies are also being conducted to support the work with the aim of achieving the best balance between the submarines' capability and their cost. In addition, the propulsion system design has been reviewed in detail to ensure confidence in the performance of the submarine.

Experience from previous classes of submarines has been drawn upon to continue to improve the design process and so reduce the risks for later phases of the programme including Build, Test and Commissioning and for long term operation. Design principles known as 'Design for Build', 'Design for Safety', and 'Design for Support' have been established. These provide guidance to designers, improving the efficiency of the design process, and providing greater confidence in producing an overall design that meets the operational requirements for the Submarine, without the need for late changes during the Build Phase, historically a common cause of cost increases and delays. Further activities have been undertaken to prepare for checking the design against the actual requirements, which will support the subsequent decision to start building the submarines. The programme is reviewed periodically by the MOD to provide further assurance that the targets for design maturity are met at each stage of the programme.

Drawing on lessons from the Astute submarine programme, a joint Industry/MOD Integrated Programme Management Team (IPMT) has been established. This is a collaboration between the MOD and our three principal Industrial Partners (BAE Systems, Rolls-Royce and Babcock Marine). The IPMT is working effectively and has produced, refined and matured an Integrated Master Schedule (IMS), which aligns all the different processes across the MOD and Industry. The IMS describes all activities from design, build, test and commissioning to the exit from Barrow. Joint US/UK work on the Common Missile Compartment element of the programme, and work in Derby to complete the design of the Pressurised Water Reactor, remains on track.

There has been a steady increase in the number of people working on the programme at BAE Systems shipyard at Barrow-in-Furness. The total has now passed 1,000 and will increase further as work progresses. The facilities required to support the build process after Main Gate are being assessed.

Affordability is an important element of all planning activities, and a formal Cost Challenge process has been undertaken, alongside work on delivering the savings that will result from the decision announced in the 2010 Strategic Defence and Security Review to make a reduction to no more than 40 operational warheads on eight operational missiles.

## Commercial Arrangements

The award of framework contracts with BAE Systems and Babcock, and an amendment to an existing Rolls-Royce contract, was announced to Parliament by the Secretary of State for Defence on 22 May 2012. These framework contracts cover the period up to Main Gate and consist of an overarching framework structure with rolling waves of work packages. A Collaborative Agreement between all three companies and the MOD was also signed. This governs the relationships between industrial parties' performance and profit retention. The Secretary of State for Defence also announced the first set of work packages under the framework contracts; these covered the first 18 months of work on the Assessment Phase and were valued at £350 million. More recently the Secretary of State for Defence announced (on 29 October 2012) that the MOD has agreed the second set of work packages for the programme. These work packages, which are with BAE Systems and Babcock, cover the next 18 months of work and are also valued at £350 million. The MOD intends to negotiate further packages in the same manner until the Assessment phase concludes at Main Gate.

## Long Lead Items

Long lead items are those items which need to be ordered prior to the Main Gate decision so that they are available for use in the early part of the production phase in order to reduce risks to the schedule. To date, the Department has spent £17 million on long lead items for the Successor submarines which was approved in the concept phase. Over the past year, work has also begun on the strategy for the procurement of additional long lead items from the three UK Industrial Partners, most of which will not need to be ordered until 2013.

It is expected that reactor long lead items will form the larger part of long lead spending in the period up to Main Gate. The reactor cores themselves will be produced under a separate Core Production Capability contract with Rolls-Royce (announced on 18 June 2012), although actual manufacture of the core for Successor Boat One will not commence until after the Successor Main Gate decision.

# Submarine Costs

Of the £3Bn we plan to spend in the Assessment Phase, the expenditure to the end of Financial Year 2011/2012 has totalled £315M. This is some £30M lower than expected at the time of the Initial Gate approval, principally as a result of slower than expected manpower build-up in our Industrial partners. We do not expect this to cause a delay to the programme and, overall, the MOD still expects to deliver the Assessment Phase within the approved cost of £3Bn.

As highlighted in the Initial Gate Parliamentary Report, working with our industry partners under the Submarine Enterprise Performance Programme (SEPP) remains key to delivering the successor deterrent programme to the agreed performance, cost and time. Progress on SEPP, with its key objectives of securing sustainability, driving down cost and improving performance of the submarine enterprise, has been good, and the programme is on track to deliver the expected savings of at least £900M by 2020/21. The performance of the overall submarine enterprise is also steadily improving, as demonstrated by the exit from Barrow of HMS AMBUSH, the second of the Astute Class submarines, in September 2012, and the planned return of HMS VIGILANT to operational duties early in 2013.

Current forecast costs, including planned SEPP efficiency measures, indicate that we remain within the 2006 White Paper estimates of £11-14Bn (at 2006/7 prices) for the Successor platform costs (assuming a four boat fleet).

# Wider Programme Costs

The 2006 White Paper also recognised that investment of £4-6Bn (at 2006/7 prices) would be required for supporting infrastructure and a replacement warhead (£2-3 Bn for each element). As set out in the 2011 report, the MOD plans to spend some £8M between 2011 and 2013 assessing the requirement for additional infrastructure investment. The 2011 report also noted that a decision on whether to refurbish or replace the existing warhead design could be deferred until the next Parliament, as the current warhead design is now planned to continue in service until the 2030s.

# Future

Over the next year, activity will be focused on the functional design of the Submarine's constituent systems. A whole boat System Definition Review in 2013 will be conducted to demonstrate that the proposed system architecture meets the detailed requirements that the MOD has set for the submarine.

A series of Major System Reviews will ensure that every system will meet its individual functional requirements and that, collectively, they can be efficiently integrated to meet the overall User Requirement. In parallel, the layout of the Submarine will be designed in progressive detail to match the increasing detail of the system specifications. The Build

Strategy and the associated Test and Commissioning Strategy will also be progressively refined. The collaborative management arrangements introduced last year will be refined further and the increased understanding between contractors will enable the identification and removal of duplication and inefficiency. The next iteration of the submarine safety case, which will set out the basis of the claim that the submarine is safe to own and operate, will also be delivered.

A further report to parliament will be made in 2013.

