BRIEFING
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Trident replacement: what comes next?

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Timescale

The process of acquiring a replacement for Britain's Trident nuclear weapons system has started. This will guarantee that the United Kingdom has nuclear weapons into the 2050s. The Defence White Paper 2006 has stated that the replacement for Trident will consist of another submarine-based system, with similar components of missiles and warheads, planned to come into service around 2024 with a lifespan of 25 years.

New submarines

A Future Submarine Integrated Project Team (IPT) was set up in 2007 to begin a 2-year concept studies phase for the new submarines. Contracts for this phase have been awarded to BAE Systems, Rolls Royce and Babcock Marine[1] . At the end of this part of the design phase, the 'Initial Gate' – expected in the second half of 2009 - is the first point where the project must be approved (project teams and sponsors will be expected to provide a business case to justify the project moving on to the following stage). Once the overall design phase is concluded, the next key decision point is the 'Main Gate' between 2012 and 2014; contracts and investment for the development of the submarines will be agreed at this point.

Former Foreign Secretary, Margaret Beckett promised regular reports to parliament on the programme[2]. Former Defence Secretary Des Browne stated that the first full report to parliament on the progress of the project will be made after the Initial Gate in 2009; interim reports on the project may be provided, 'depending on progress'.[3]

3 or 4 submarines

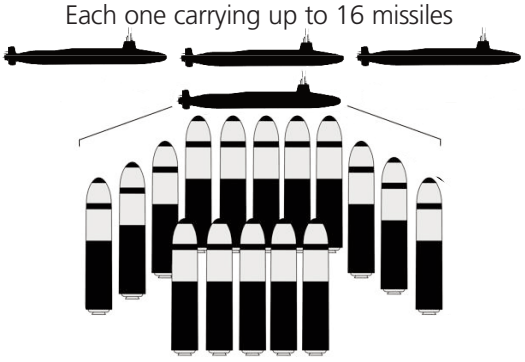
In the Defence White Paper it was suggested that the new system may only require three submarines, instead of the four that the current Trident system maintains. The White Paper states that a final decision on this will be made when more is known about the design details [4].

New nuclear reactors

The replacement submarines may be powered by a new type of nuclear reactor which Rolls Royce is likely to design and produce at its plant in Derby. Such a new reactor would need to be tested at a specialist nuclear testing facility such as the one also run by Rolls Royce at Dounreay in Scotland, the Vulcan Naval Reactor Test Establishment [5]. Although this site is due to be

Trident
– the UK's current nuclear weapons

4 nuclear powered submarines
(one on patrol at all times)
Each one carrying up to 16 missiles



Equipped with up to 48 nuclear warheads

Each nuclear warhead has 8 times the explosive power of the bomb dropped on Hiroshima

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decommissioned in 2014, such a project could mean that a new testing reactor would be built there and the plans for decommissioning would be cancelled.

Replacement missiles

Life extension

The current arrangement is that the UK leases Trident II D-5 missiles from a US pool of missiles. This missile leasing arrangement is planned to continue with the UK participating in a US life extension programme for the missiles. The Trident II D-5a is planned to be in service from 2029 until the early 2040s. It will have a modernised guidance system that is believed to improve its accuracy[6]. The Defence White Paper stated that participation in the programme would cost an additional £250 million beyond the government's projected overall acquisition cost of £15-20 billion[7].

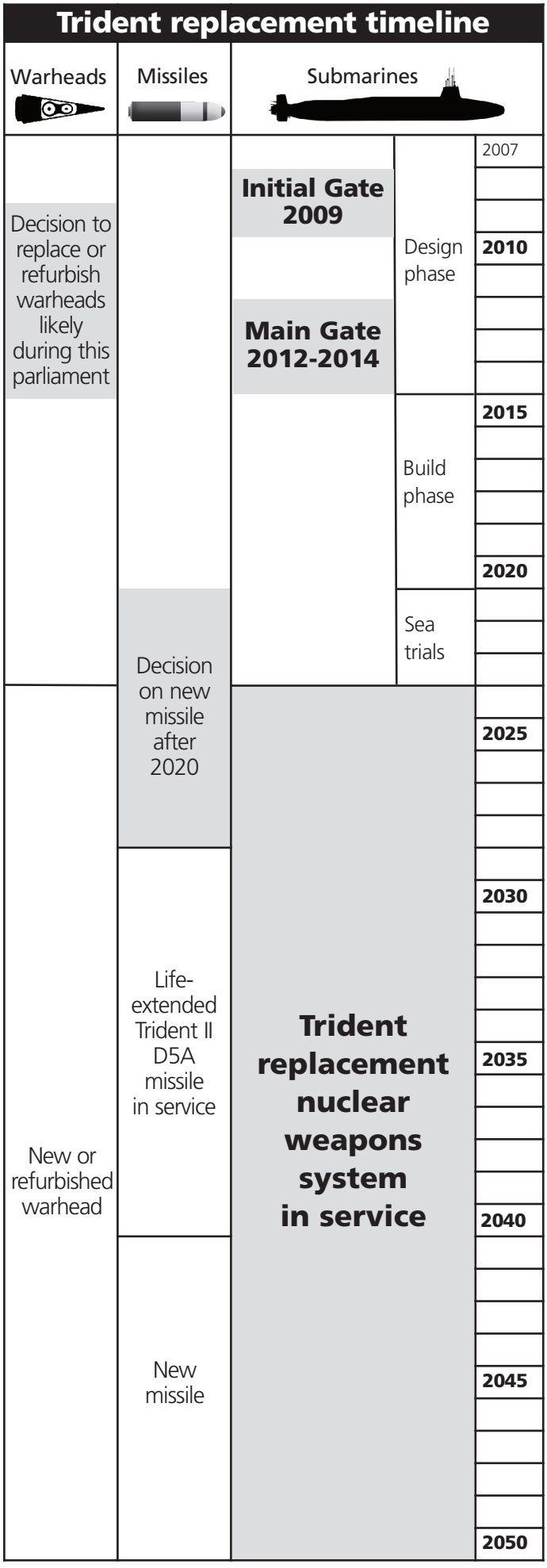
New missiles

As the new Trident replacement submarines are planned to run until 2050, new missiles will be procured once the 'life extended' Trident II D5-a becomes obsolete in the early 2040s. According to the White Paper, decisions on this 'are unlikely to be necessary until the 2020s' and the US has made assurances that any successor missiles they develop will be compatible with the UK's Trident replacement system[8]. Costs for a new missile will be additional and could begin accruing in the 2030s; the White Paper does not attempt to make estimates but states that the current Trident II D-5 missiles cost £1.5 billion in today's prices[9] .

The nuclear warheads

Trident's current warhead design is generally believed to be based on the US W76 warhead with which the US Trident system is armed[10]. The US has developed a new Arming, Fuzing and Firing System (MK4A) for the W76 and the UK warhead is also being equipped with this system. The MK4A is said to give improved military capability against more targets, in particular a 'hard target kill' capability against hardened targets such as bunkers[11][12] .

The current warhead design may only last into the 2020s according to the Defence White Paper[13] and will either need to be refurbished or replaced in time for the new submarines. The White Paper states that decisions about



this will be made in the next parliament. Ahead of such decisions however, Ministry of Defence documents indicate that senior defence officials have told industry representatives the warhead will be replaced[14]. In the meantime, and under the US-UK nuclear Mutual Defence Agreement, 'activities will be undertaken with the United States' to 'analyse the range of replacement options available' and review the existing stockpile.'

New or refurbished warhead

A refurbished warhead would be a modernised version of the current warhead using both old and new components. A new 'High Surety Warhead' is also being considered at the Atomic Weapons Establishment at Aldermaston. This is said to be similar to the 'Reliable Replacement Warhead' the US has been developing although funding for it has recently been withdrawn by Congress. Reported by the *Glasgow Herald*, it is believed that these type of warheads would not need to be tested underground (and would avoid contravening the Comprehensive Test Ban Treaty) as they would be more dependable, containing 'fewer degradable components, giving them a longer shelf-life'[15] . Whichever warhead design the UK chooses, according to the Defence White Paper, a lower yield variability (so the explosive power can be changed), combined with varying the numbers of both missiles and warheads on the system, makes for a 'more credible deterrent against smaller nuclear threats'.[16]

Tritium production

Tritium is a radioactive gas used to 'boost' the yield (explosive power) of modern nuclear warheads. A special nuclear reactor at Chapelcross in South West Scotland produced tritium until 2005 when it was decommissioned. To continue with nuclear warhead production at AWE Aldermaston until the 2050s the UK will need to acquire new sources of tritium as it loses its efficacy over a period of decades and new sources need to be replaced. This might mean a new facility producing tritium or supplies coming from the US. When questioned on costs, Former Defence Secretary Des Browne stated that supplies will be reviewed.[17]

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1 Richard Scott, *UK starts concept work for future submarine,* Jane's Defence Weekly, Volume 44, issue 46, 14 November 2007
2 House of Commons, Debates, *Trident*, 14th March 2007, Column 309
3 House of Commons, Written Answers, *Submarines: Procurement*, 26th July 2007, Column 1236W
4 Defence White Paper, *The Future of the United Kingdom's Nuclear Deterrent*, December 2006, The Stationery Office Limited, 3-4
5 Rob Edwards, *Dounreay likely site for new reactor*, The Sunday Herald, 19th August 2007
6 Lockheed Martin press release, 9th April 2007
7 Defence White Paper, *The Future of the United Kingdom's Nuclear Deterrent*, December 2006, The Stationery Office Limited, 5-10
8 Ibid, 7-6
9 Ibid, 5-11
10 The US Trident system also uses a W88 warhead which has an even higher yield of 475 kilotons compared to the W76's 100 kilotons
11 http://www.fas.org/blog/ssp/2007/08/us_tripples_submarine_warhead.php
12 http://www.fas.org/blog/ssp/2007/03/
13 Defence White Paper, *The Future of the United Kingdom's Nuclear Deterrent*, December 2006, The Stationery Office Limited, 3-4
14 http://www.cnduk.org/index.php/press-releases/trident/secret-plan-to-replace-nuclear-warheads-parliament-misled.html
15 http://www.theherald.co.uk/search/display.var.1661681.0.britain_in_topsecret_work_on_new_atomic_warhead.php
16 Defence White Paper, The Future of the United Kingdom's Nuclear Deterrent, December 2006, The Stationery Office Limited, 3-4
17 House of Commons, Written Answers, *Nuclear Weapons*, Column 6994