III. British nuclear forces

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As of January 2016 the United Kingdom's nuclear stockpile consisted of approximately 215 warheads (see table 16.4). The British nuclear deterrent consists exclusively of a sea-based component: four Vanguard class Trident nuclear-powered ballistic missile submarines (SSBNs) armed with up to 16 UGM-133 Trident II D5 submarine-launched ballistic missiles (SLBMs). The submarines are based at Faslane in western Scotland, and the nuclear warheads are stored and maintained at the Royal Naval Armaments Depot at Coulport. In 2015 the British Ministry of Defence's (MOD) nuclear weapon safety and custodial security practices came under critical scrutiny, following reports of serious security lapses and a poor safety culture at the Faslane base.[1]

The UK possesses a total of 48 Trident II D5 SLBMs, enough to fully arm the 3 SSBNs that are operational at any given time. The UK does not own the missiles, but leases them from a pool of 58 Trident SLBMs shared with the United States Navy. The UK has joined a US programme to extend the service life of the Trident II D5 missile from 2028 until 2042.[2]

Of the estimated 215 nuclear warheads currently in its stockpile, the UK maintains approximately 120 operational warheads for loading on the Trident II SLBMs. Although the missiles can carry up to 12 multiple independently targetable re-entry vehicles (MIRVs), under limits imposed in the 2010 Strategic Defence and Security Review (SDSR), the Vanguard class SSBNs are armed with no more than 8 operational missiles and 40 nuclear warheads when on patrol.[3]

The UK enjoys close cooperation with the USA on nuclear warhead design and production, including the sharing of warhead components, as well as on stockpile maintenance under the terms of the 1958 US–UK Mutual Defence Agreement (MDA).[4] The current warhead, which is believed to be to similar

[1] Morley, J., 'UK submariner cites safety flaws', *Arms Control Today*, vol. 45, no. 6 (July–Aug. 2015); and Stone, J., 'Britain's nuclear weapons base suffers from "serious" nuclear safety incidents and "poor safety culture"', *The Independent*, 2 Mar. 2015.

[2] Mills, C., 'Replacing the UK's nuclear deterrent', British Parliament, *House of Commons Library Briefing Paper* no. 7353, 12 Nov. 2015, p. 4.

[3] British Ministry of Defence, *Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review*, Cm 7948 (Stationery Office: London, Oct. 2010) pp. 5, 38; and Mills (note 2), p. 13.

[4] The MDA, which was extended in 2014 for an additional 10-year period, provides for the 2 parties to share classified information and scientific knowledge related to their nuclear weapon programmes. Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the United States of America for Cooperation on the Uses of Atomic Energy for Mutual Defence Purposes, Washington DC, 3 July 1958.

Table 16.4. British nuclear forces, January 2016

Type	Designation	No. deployed	Year first deployed	Range (km)[a]	Warheads x yield	No. of warheads
Submarine-launched ballistic missiles[b]						
D5	Trident II	48	1994	>7 400	1–3 x 100 kt	215[c]

kt = kilotons.

[a] Range is for illustrative purposes only; actual mission range will vary according to flight profile and weapon loading.

[b] The operational SSBNs carry a reduced loading of no more than 8 Trident II missiles and 40 nuclear warheads. One submarine is on patrol at any given time.

[c] Of the estimated 215 warheads currently in the stockpile, 120 are operationally available. The process to reduce the stockpile to 180 warheads by the mid-2020s is underway.

Sources: British Ministry of Defence, white papers, press releases and website, <http://www.mod.uk/>; British House of Commons, *Hansard*, various issues; 'Nuclear notebook', *Bulletin of the Atomic Scientists*, various issues; and authors' estimate.

to the US W76 warhead, was first deployed in the early 1990s and is expected to remain in service until the 2030s.[5]

The latest SDSR, released in November 2015, reaffirmed the MOD's plan set out in the 2010 SDSR to cut the size of the British nuclear arsenal. The stockpile of operationally available nuclear warheads has already been reduced from 180 to the new limit of 120, of which no more than 40 warheads are deployed on submarine patrol at any given time. The overall size of the nuclear stockpile, including non-deployed warheads, will decrease to 'no more than 180 by the mid-2020s'.[6]

The Trident replacement programme

In the much-anticipated 2015 SDSR, the British Government made a commitment to replace the four Vanguard class SSBNs with a new class of four submarines. It also committed the UK to maintaining for the indefinite future the posture known as continuous at-sea deterrence (CASD), whereby one Vanguard class SSBN is on patrol at all times.[7] The commitments reflected the main conclusions of the Government's 2013 Trident Alternatives Review study, which judged that questions about the costs, feasibility and deterrence credibility of the alternative systems and postures under consideration made them riskier options than the Government's preferred 'like-for-like' Trident replacement programme.[8]

[5] Chalmers, H., *The Bang Behind the Buck*, Occasional Paper (Royal United Services Institute: London, Mar. 2014).

[6] British Government, *National Security Strategy and Strategic Defence and Security Review 2015: A Secure and Prosperous United Kingdom*, Cm 9161 (Stationery Office: London, Nov. 2015), para. 4.66.

[7] British Government (note 6), para. 4.73.

[8] British Government, *Trident Alternatives Review* (Cabinet Office: London, 16 July 2013).

The new class of submarines, currently known as Successor, will be similar to the Vanguard class. It will carry Trident II D5 SLBMs and be powered by a new generation of nuclear propulsion reactors. However, as a cost-saving measure, the submarine will have a smaller missile compartment, holding eight missile launch tubes, designed jointly with the US Navy.[9]

The 2015 SDSR states that the entry into service of the Successor class submarines will be delayed as part of an extended development and acquisition programme. The MOD commenced design work on the new submarine following the government's 'Initial Gate' decision in 2011 to proceed with the programme beyond the concept phase. The retirement of the Vanguard class SSBNs, which was due to begin in 2028, has been put back to the 'early 2030s'.[10] The replacement of the current warhead has been similarly postponed until 'at least the late 2030s, possibly later'.[11]

As part of a comprehensive restructuring of the Trident replacement programme, the 2015 SDSR retreats from several milestones previously set for the programme. The review does not indicate when the detailed plans for the design, production and procurement of the Successor class submarines will be finalized. Nor does it confirm that the 'Main Gate' decision on whether to proceed with the new submarine will be submitted to parliament for a vote in 2016, as previously promised by the government. The SDSR cautions that a 'traditional single "Main Gate" approach' is 'not appropriate for a programme of this scale and complexity'. Instead, the replacement of the submarines will be regularly assessed under a 'staged investment programme'.[12]

The cost of the Trident successor programme continues to be a source of political controversy in the UK.[13] In December 2014 the MOD reported that it estimated the total cost of the Trident successor programme to be £25 billion ($36.5 billion).[14] In the 2015 SDSR, however, the estimated cost of the proposed four nuclear submarines had risen to £31billion ($45.2 billion). The review set aside a further contingency of £10 billion ($14.6 billion), suggesting the MOD believes that the costs could rise beyond the current estimate.[15] Some critics have argued that the real cost of building, maintaining and operating the new submarines over many years is likely to be much higher

[9] Nuclear Information Service, 'Confusion over pledge to reduce number of missile tubes in new Trident submarines', 5 Dec. 2014.

[10] British Government (note 6), paras 4.65, 4.76.

[11] British Government (note 6), paras 4.72.

[12] British Government (note 6), para. 4.75.

[13] Dowd, J. and Sloggett, C., 'Trident future back on election agenda as costs spiral', *The Guardian*, 17 Jan. 2015.

[14] British Ministry of Defence, 'The United Kingdom's future nuclear deterrent: 2014 update to parliament', 15 Dec. 2014, p. 6.

[15] British Government (note 6), para. 4.76; and MacAskill, E. and Watt, N., 'Trident renewal costs rise by £6bn, defence review reveals', *The Guardian*, 23 Nov. 2015.

than the MOD's estimate—possibly as much as £167 billion pounds ($256 billion), according to one parliamentarian's calculation.[16] The sharply rising cost projections for the Trident replacement programme led to renewed calls in 2015 for alternative postures to be examined.[17]

[16] Piper, E., 'Exclusive: UK nuclear deterrent to cost $256 billion, far more than expected', Reuters, 25 Oct. 2015. See also Campaign for Nuclear Disarmament (CND), *The Real Alternative: What the Government's Trident Alternative Review Isn't Telling You* (CND: London, June 2013), p. 5.

[17] Ingram, P., 'Trident cost-saving options', *Huffington Post*, 27 Oct. 2015.