III. British nuclear forces

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The United Kingdom's nuclear deterrent consists exclusively of a sea-based component: Vanguard class Trident nuclear-powered ballistic missile submarines (SSBNs) armed with Trident II (designated D5) submarine-launched ballistic missiles (SLBMs) and associated warheads, and their support infrastructure. The UK possesses an arsenal of about 160 operational nuclear warheads that are available for use by a fleet of four Trident SSBNs based at Faslane, western Scotland (see table 6.4). The UK leases 58 Trident II (D5) SLBMs from the United States Navy under a system of 'mingled asset ownership'.

Each Vanguard SSBN is equipped with 16 Trident II (D5) missiles, each carrying up to 3 warheads, for a total of up to 48 warheads. The warhead is similar to the US W76 warhead; it has been upgraded with the US-produced arming, fusing and firing system for the Trident II's Mk-4A re-entry vehicle, which improves the accuracy of the missile and increases its ability to destroy hardened targets.[1] In 2006 the UK joined a US-led programme to extend the service life of the D5 missile from 2028 until 2042. The D5 life-extension programme came under public criticism in 2013 following media reports that its annual cost had increased sharply as the programme entered the main procurement phase.[2]

It is believed that a number of the D5 missiles are deployed with only one warhead, possibly with a reduced explosive yield. This reflects a decision by the British Ministry of Defence (MOD) in 1998 to give a 'sub-strategic', or limited-strike, role to the Trident fleet, with the intention of enhancing the flexibility of nuclear targeting options—specifically, 'an option for a limited strike that would not automatically lead to a full scale nuclear exchange'.[3] An addendum in 2002 extended the role of nuclear weapons to include deterring 'leaders of states of concern and terrorist organisations'.[4]

In a posture known as Continuous At-Sea Deterrence (CASD), one British SSBN is on patrol at all times. While the second and third SSBNs can be put to sea rapidly, the fourth would take longer because of its cycle of extensive overhaul and maintenance. Since the end of the cold war, the

[1] According to some reports, the UK is procuring the US-produced W76-1 warhead for its Trident missiles. Kristensen, H. M., 'British submarines to receive upgraded US nuclear warhead', Strategic Security, Federation of American Scientists, 1 Apr. 2011, <http://fas.org/blogs/security/2011/04/britishw76-1/>.

[2] Edwards, R., 'Trident costs rocket by over 600%', *The Herald*, 24 Nov. 2013.

[3] British Ministry of Defence, *The Strategic Defence Review: Modern Forces for the Modern World*, Cm 3999 (The Stationery Office: London, July 1998), para. 63.

[4] British Ministry of Defence, *The Strategic Defence Review: A New Chapter*, Cm 5566, vol. 1 (The Stationery Office: London, July 2002), para. 21.

Table 6.4. British nuclear forces, January 2014

Type	Designation	No. deployed	Year first deployed	Range (km)	Warheads x yield	No. of warheads
Submarine-launched ballistic missiles						
Trident II	D5	48	1994	>7 400	1–3 x 100 kilotons	225[a]

[a] Fewer than 160 warheads are operationally available, *c.* 144 to arm 48 missiles on 3 of 4 nuclear-powered ballistic missile submarines (SSBNs). Only 1 SSBN is on patrol at any time, with up to 48 warheads. In 2010 it was decided that the number of operational warheads will be reduced to a maximum of 120, of which 40 will be on patrol at any given time. The stockpile will be reduced to no more than 180 by the mid-2020s.

Sources: British Ministry of Defence, white papers, press releases and website, <http://www.gov.uk/government/organisations/ministry-of-defence/>; British House of Commons, *Hansard*, various issues; Norris, R. S. et al., *Nuclear Weapons Databook*, vol. 5, *British, French, and Chinese Nuclear Weapons* (Westview: Boulder, CO, 1994), p. 9; 'Nuclear notebook', *Bulletin of the Atomic Scientists*, various issues; and authors' estimates.

SSBN on patrol has been kept at a level of reduced readiness with its missiles de-targeted and a 'notice to fire' measured in days.[5]

In the 2010 Strategic Defence and Security Review (SDSR) the British Government made a commitment to retain a continuous submarine-based nuclear deterrent force for the indefinite future.[6] The MOD currently plans to replace the four Vanguard class SSBNs, which will reach the end of their service lives from 2024, with new submarines equipped with modified Trident II (D5) SLBMs at an estimated initial cost of £20 billion ($31 billion) at 2006 prices.[7] As a cost-saving measure they will have a smaller missile compartment designed jointly with the US Navy and equipped with 8 launch tubes carrying no more than 40 warheads.[8] The SDSR deferred the 'main gate' decision—on when the detailed acquisition plans, design and number of the successor submarines are to be finalized—until 2016.

In July 2013 the British Government released the results of a Trident Alternatives Review that began in 2011. The purpose of the study was 'to establish if other postures or weapons systems might deliver a credible alternative nuclear deterrent' that, during a crisis, would still be 'able to deliver at short notice a nuclear strike against a range of targets at an appropriate scale and with very high confidence'.[9] The study had been motivated by criticism from within the governing coalition of the estimated

[5] British Ministry of Defence and British Foreign and Commonwealth Office, *The Future of the United Kingdom's Nuclear Deterrent*, Cm 6994 (The Stationery Office: Norwich, Dec. 2006), p. 13.

[6] British Ministry of Defence, *Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review*, Cm 7948 (The Stationery Office: London, Oct. 2010), paras 3.8–3.9.

[7] British Ministry of Defence (note 6), para. 3.10.

[8] British Ministry of Defence (note 6), paras 3.11–3.12, 3.14.

[9] British Cabinet Office, *Trident Alternatives Review* (Cabinet Office: London, 16 July 2013), pp. 3, 14.

cost of replacing each of the existing Trident submarines with a new submarine of a similar type.[10]

The Trident Alternatives Review considered a range of alternative nuclear postures, including non-continuous SSBN patrols, with decreasing levels of operational readiness. It applied these postures to a number of force planning options, such as deploying nuclear-armed cruise missiles (instead of ballistic missiles) on aircraft, surface ships and on multi-role submarines. The study acknowledged that there were alternatives to the current posture that would enable the UK to inflict 'significant damage' and deter aggressors. However, it concluded that none of the other nuclear postures under consideration offered 'the same degree of resilience' as CASD or guaranteed a 'prompt response in all circumstances'.[11] The study also concluded that all of the alternatives to the like-for-like Trident replacement programme would be more expensive because they required the development and production of new warheads, missiles, launch platforms and support infrastructure.[12]

The study's conclusions were disputed by critics of the Trident replacement plan. Some argued that the real cost of building and operating the new submarines over many years would probably be much higher—possibly more than £100 billion ($155 billion)—than the MOD's estimate.[13] Others criticized the study for being fundamentally outdated in focusing on nuclear deterrence and the operational capacities of CASD while ignoring options, including non-nuclear postures, more relevant for addressing current and future security challenges.[14]

The 2010 SDSR revealed plans to cut the size of the British nuclear arsenal. The stockpile of operational nuclear warheads will be reduced 'over the next few years' from fewer than 160 to no more than 120, of which 40 will be on patrol at any given time. Likewise, the overall size of the nuclear stockpile, including non-deployed weapons, will decrease from the current 225 warheads to 'not more than 180 by the mid 2020s'.[15] In 2013 the MOD revealed a programme 'to disassemble Trident warheads' at the Atomic Weapon Establishment at Burghfield, south-eastern England.[16] Some of the warheads had been rendered unusable while others, identified as no longer being required for service, had been placed in storage.

[10] Hopkins, N., 'Trident: no need for like-for-like replacement, says Danny Alexander', *The Guardian*, 23 Jan. 2013.

[11] British Cabinet Office (note 9), p. 10.

[12] British Cabinet Office (note 9), p. 11.

[13] Campaign for Nuclear Disarmament (CND), *The Real Alternative: What the Government's Trident Alternatives Review Isn't Telling You* (CND: London, June 2013), p. 5.

[14] Grossman, E. M., 'Does Britain really need its own nuclear arsenal?', Global Security Newswire, 11 Oct. 2013, <http://www.nti.org/gsn/article/does-britain-really-need-its-own-nuclear-arsenal/>.

[15] British Ministry of Defence (note 6), para. 3.11.

[16] Edwards, R., 'UK's nuclear weapons being dismantled under disarmament obligations', *The Guardian*, 11 Aug. 2013.