

III. British nuclear forces

SHANNON N. KILE, PHILLIP SCHELL AND HANS M. KRISTENSEN

The United Kingdom's nuclear deterrent consists exclusively of a sea-based component: Vanguard class Trident nuclear-powered ballistic missile submarine (SSBNs), Trident II (D5) submarine-launched ballistic missiles (SLBMs) and associated warheads, and 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 (see table 7.4). The UK leases the Trident II (D5) SLBMs from the US Navy under a system of 'mingled asset ownership'.

Each Vanguard class SSBN is equipped with 16 Trident II (D5) missiles carrying up to 48 warheads (i.e. up to 3 per missile). The warhead is similar to the US W76 warhead and has an explosive yield of about 100 kilotons. It is being upgraded with the US-produced arming, fusing and firing system for the Mk-4A re-entry vehicle. It is believed that a number of the D5 missiles are deployed with only one warhead, possibly with a reduced explosive yield, instead of three.¹ The reduced force-loading option reflects a decision by the Ministry of Defence (MOD) in 1998 to give a 'sub-strategic', or limited-strike, role to the Trident fleet aimed at enhancing the credibility of the British deterrent.²

In a posture known as Continuous at Sea Deterrence (CASD), one British SSBN is on patrol at all times.³ While the second and third SSBNs can be put to sea rapidly, not enough missiles have been leased from the US Navy to simultaneously arm the fourth British submarine. Since the end of the cold war, the 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.

In the 2010 Strategic Defence and Security Review (SDR) the British Government made a commitment to retain a submarine-based nuclear deterrent force for the indefinite future. The MOD has plans to replace the four Vanguard class SSBNs, which will reach the end of their service lives from 2024. The new submarines will be based on the current Trident system and equipped with the modified Trident II (D5) SLBM developed under the US Navy's D5 Life Extension (LE) programme. As a cost-saving

¹ Quinlan, M., 'The future of United Kingdom nuclear weapons: shaping the debate', *International Affairs*, vol. 82, no. 4 (July 2006).

² British Ministry of Defence, *The Strategic Defence Review: Modern Forces for the Modern World*, Cm 3999 (The Stationery Office: Norwich, July 1998), para. 63. An addendum in 2002 extended the role of nuclear weapons to include deterring 'leaders of states of concern and terrorist organisations'. British Ministry of Defence, *The Strategic Defence Review: A New Chapter*, Cm 5566, vol. 1 (The Stationery Office: Norwich, July 2002), para. 21.

³ 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. 27.

measure, they will have a smaller missile compartment, designed jointly with the US Navy, that will carry 12 launch tubes rather than the 16 carried by the Vanguard class submarines. The maximum number of nuclear warheads carried on each submarine will decrease from 48 to 40.⁴

In May 2011 the MOD announced the completion of the ‘initial gate’ phase for the replacement submarine programme. This involved decisions about the broad design parameters for the new SSBN, including the choice of reactor propulsion systems.⁵ The SDR delayed the ‘main gate’ decision—when the detailed acquisition plans, design and number of submarines are to be finalized—until 2016. As a result, the first of the new generation of SSBNs is not scheduled to enter service until 2028. The service lives of the Vanguard submarines are to be further prolonged in accordance with the government’s commitment to reliably sustain the CASD posture.

The 2010 SDR revealed plans for cutting the size of the British nuclear arsenal. The stockpile of operational nuclear warheads will be reduced from fewer than 160 at present to no more than 120. 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’.⁶

In announcing the results of the SDR, the British Government said it would defer a decision about whether to refurbish or replace the nuclear warhead carried on the Trident II (D5) SLBM until the next parliament (i.e. after May 2015).⁷ However, in 2011 there were reports, based on a publication from the US Sandia National Laboratory, indicating that the Royal Navy has decided to procure the W76-1 warhead that is currently in production in the USA.⁸ The warhead is an enhanced version of the US W76 warhead and will make Trident missiles more accurate and more effective against hardened targets.⁹ Together with the modified D5LE SLBMs, the new warhead will extend the service life of the Trident missile system into the 2040s.

The UK has launched a long-term investment programme aimed at sustaining key skills and facilities at the Atomic Weapons Establishment at Aldermaston. In 2011 the MOD confirmed that it plans to build a new

⁴ 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), para. 3.11, p. 38.

⁵ British Ministry of Defence (MOD), *The United Kingdom’s Future Nuclear Deterrent: The Submarine Initial Gate Parliamentary Report* (MOD: London, May 2011), p. 5.

⁶ British Ministry of Defence (note 4), para. 3.11, p. 39; and Norton-Taylor, R., ‘Britain’s nuclear arsenal is 225 warheads, reveals William Hague’, *The Guardian*, 26 May 2010.

⁷ British Ministry of Defence (note 4), para. 3.9, p. 39.

⁸ Kristensen, H. M., ‘British submarines to receive upgraded US nuclear warhead’, FAS Strategic Security Blog, Federation of American Scientists, 1 Apr. 2011, <<http://www.fas.org/blog/ssp/2011/04/britishw76-1.php>>.

⁹ Norton-Taylor, R., ‘Trident more effective with US arming device, tests suggest’, *The Guardian*, 6 Apr. 2011.

Table 7.4. British nuclear forces, January 2012

Type	Designation	No. deployed	Year first deployed	Range (km) ^a	Warheads x yield	Warheads in stockpile
<i>Submarine-launched ballistic missiles</i>						
D5	Trident II	48	1994	>7 400	1–3 x 100 kilotons	225 ^b

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

^b 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 within the next few years, 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.mod.uk/>>; British House of Commons, *Parliamentary Debates (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' estimate.

facility at Aldermaston to store and handle enriched uranium components for nuclear warheads and reactor fuel for nuclear-powered submarines. It is intended to replace an ageing facility built in the 1950s that does not meet modern safety design standards.¹⁰

The British–French nuclear cooperation agreement

On 2 November 2010 France and the UK signed an agreement for technical cooperation and the exchange of classified information in the areas of nuclear weapon safety, and security and stockpile certification. The agreement entered into force in July 2011 and entails the establishment of 'joint radiographic/hydrodynamics facilities', one in France and one in the UK, to conduct computer-based testing of nuclear weapon components to ensure their safety and reliability in the absence of explosive testing of nuclear weapons.¹¹ Both countries, however, emphasized that they will continue to maintain independent nuclear deterrent forces under the agreement.

¹⁰ '£750m spend on AWE enriched uranium facility revealed', BBC News, 10 Oct. 2011, <<http://www.bbc.co.uk/news/uk-england-berkshire-15189981>>.

¹¹ Joint Anglo-French communiqué, Présidence de la République/Cabinet Office, 8 July 2011, <<https://update.cabinetoffice.gov.uk/resource-library/joint-french-anglo-communiqué>>; and Treaty between the United Kingdom of Great Britain and Northern Ireland and the French Republic relating to Joint Radiographic/Hydrodynamics Facilities, signed 2 Nov. 2010, Cm 7975 (The Stationery Office: Norwich, 10 Nov. 2010).