III. British nuclear forces

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As of January 2019, the British nuclear stockpile consisted of approximately 200 warheads (see table 6.4). In its 2015 Strategic Defence and Security Review (SDSR), the British Government reaffirmed its plans to cut the size of the nuclear arsenal. The number of operationally available nuclear warheads has been reduced to no more than 120. The overall size of the nuclear stockpile, including non-deployed warheads, will decrease to no more than 180 by the mid 2020s.[1]

The British nuclear deterrent consists exclusively of a sea-based component: four Vanguard class Trident nuclear-powered ballistic missile submarines (SSBNs).[2] 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 the cycle of extensive overhaul and maintenance.

The Vanguard class SSBNs can each be armed with up to 16 UGM-133 Trident II D5 submarine-launched ballistic missiles (SLBMs). The United Kingdom does not own the missiles but leases them from a pool of 58 Trident SLBMs shared with the United States Navy at the US Strategic Weapons Facility in King's Bay, Georgia.[3] Under limits set out in the 2010 SDSR, when on patrol, the submarines are armed with no more than 8 operational missiles with a total of 40 nuclear warheads.[4] The missiles are kept in a 'detargeted' mode (i.e. the target data would need to be loaded into the guidance system before launch) and in a reduced alert status, meaning that several days' notice would be required to fire the missiles.[5]

[1] 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.

[2] HMS *Vanguard* entered service in Dec. 1994, while the last in class, HMS *Vengeance*, entered service in Feb. 2001. Mills, C., *Replacing the UK's Strategic Nuclear Deterrent: Progress of the Dreadnought Class,* Briefing Paper 8010 (House of Commons Library: London, 22 May 2018), p. 9.

[3] Allison, G., 'No, America doesn't control Britain's nuclear weapons', UK Defence Journal, 20 July 2017.

[4] British Government, *Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review*, Cm 7948 (Stationery Office: London, Oct. 2010), pp. 5, 38.

[5] British Government, 'The UK's nuclear deterrent: What you need to know', Policy paper, updated 19 Feb. 2018.

The Trident submarine successor programme

In 2016 the House of Commons approved by a large majority a motion supporting the British Government's commitment to a 'like-for-like' replacement of the Vanguard class SSBNs with four new ballistic missile submarines.[6] While recognizing that the UK's nuclear deterrent would 'remain essential to the UK's security today as it has for over 60 years', the motion did not give final approval for the new submarine programme. In order to control costs, the government had previously announced that approval of the investment would be made in stages rather than as a single 'main gate' decision.[7]

The new submarine class, which has been named Dreadnought, will have a missile compartment that holds 12 launch tubes, a reduction from the 16 carried by the Vanguard class. As a cost-saving measure, a Common Missile Compartment is being designed in cooperation with the US Navy that will also equip the latter's new Columbia class SSBNs. In 2018 there were reports of technical problems with the manufacturing of the missile launch tubes to be used in the compartment.[8] The replacement of the Trident II D5 missile is not part of the Dreadnought development and acquisition programme. However, the UK is participating in the US Navy's current programme to extend the service life of the Trident II D5 (D5LE) missile to the early 2060s.[9]

The Dreadnought submarines were originally expected to begin to enter into service by 2028 but are now expected to enter into service in the early 2030s. The delay was part of the extended development and acquisition programme announced in the 2015 SDSR. The service life of the Vanguard class SSBNs was commensurately extended.[10]

The 2015 SDSR reaffirmed that the replacement of the current British-manufactured Holbrook warhead for the Trident II missiles would not be required at least until the late 2030s. The parliament is expected to take a decision on a new warhead in 2019–20, and work continues on developing replacement options.[11] The work includes British–US collaboration on

[6] British Parliament, House of Commons, 'UK's nuclear deterrent', *Hansard*, col. 559, vol. 613, 18 July 2016.

[7] British Government (note 1), para. 4.75.

[8] Leone, D., 'Welding mistake with Columbia missile tubes was bigger problem than BWXT thought', *Defense Daily*, 8 Nov. 2018.

[9] Mills (note 2), p. 7.

[10] British Government (note 1), para. 4.65.

[11] British Ministry of Defence, 'The United Kingdom's future nuclear deterrent: The Dreadnought programme', 2017 Update to Parliament, 20 Dec. 2017, p. 2.

Table 6.4. British nuclear forces, January 2019

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	1–8 x 100 kt[c]	200[d]

kt = kilotons.

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

[b] The Vanguard class nuclear-powered ballistic missile submarines (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] The British warhead is called the Holbrook, a modified version of the United States' W76-1 warhead, with a lower-yield option.

[d] Of the estimated 200 warheads currently in the stockpile, 120 are operationally available. The process to reduce the stockpile to 180 warheads by the mid 2020s is under way.

Sources: British Ministry of Defence, white papers, press releases and website; British House of Commons, *Hansard*, various issues; 'Nuclear notebook', *Bulletin of the Atomic Scientists*, various issues; and authors' estimates.

warhead safety, security and manufacturing technologies under the Joint Technology Demonstrator project.[12] In the meantime, the British Atomic Weapons Establishment (AWE) has begun a programme to improve the performance and extend the life of the Holbrook warhead—which is modelled on the US W76-1 warhead and incorporated into the US-produced Mk4A re-entry vehicle—in collaboration with US nuclear weapon laboratories.[13]

The cost of the Dreadnought programme has been a source of concern and controversy since its inception. In 2015 the British Ministry of Defence (MOD) estimated the total cost of the programme to be £31 billion ($47.4 billion). It set aside a contingency of £10 billion ($15.3 billion) to cover possible increases.[14] In March 2018 the MOD's budget for the period 2018–19 received an additional £600 million ($800 million) from the contingency fund to keep the Dreadnought programme on schedule.[15] In its December 2018 update to parliament, the MOD reported that a total of £5.5 billion ($7.3 billion) had been spent on the programme's development, design and early manufacturing phases.[16]

[12] British Ministry of Defence (note 11).

[13] British Ministry of Defence, 'The United Kingdom's future nuclear deterrent', 2018 Update to Parliament, 20 Dec. 2018, p. 3; and Nuclear Information Service, 'AWE: Past, present, and possibilities for the future', June 2016, pp. 26–28.

[14] British Government (note 1), para. 4.76.

[15] Mehta, A. and Chuter, A., 'UK releases extra funding, but military relevancy challenges remain', *Defense News*, 29 Mar. 2018.

[16] British Ministry of Defence (note 13), p. 3. The total represented an increase of £1.3 billion ($1.7 billion) compared with 2017.

According to one non-governmental report published in 2018, given the cost and time overruns of the Dreadnought programme to date, it was unlikely to be delivered within the existing budget and would put significant pressure on the MOD's equipment procurement budget from the mid 2020s onward.[17] In May 2018 the British National Audit Office reported that the MOD was facing an 'affordability gap' of £2.9 billion ($3.9 billion) in the UK's defence nuclear programmes between 2018 and 2028. This figure included the projected costs of new missiles and warheads for the Dreadnought submarines and a new class of nuclear-powered attack submarines, as well as associated production, operations and maintenance and submarine-decommissioning costs.[18]

[17] Fenwick, T., *Blowing up the Budget: The Cost Risk of Trident to UK Defence* (British American Security Information Council: London, Sep. 2018).

[18] British National Audit Office (NAO), *The Defence Nuclear Enterprise: A Landscape Review*, Report by the Comptroller and Auditor General, HC 1003, Session 2017–2019 (NAO: London, 22 May 2018). Spending on defence nuclear programmes was estimated to account for *c*. 14% of the total defence budget for the period 2018–19.