

III. British nuclear forces

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As of January 2020, the British nuclear stockpile consisted of approximately 195–215 warheads (see table 10.4). 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 The United Kingdom is the only nuclear weapon state that operates a single deterrent capability. In a posture known as continuous at-sea deterrence (CASD), which began in 1969, one British SSBN is on patrol at all times.³ 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 UK 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 Kings Bay, Georgia.⁴ 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.⁵ The missiles are kept in a ‘detargeted’ mode, meaning that target data would need to be loaded into the guidance system before launch, and have a reduced alert status (i.e. several days’ notice would be required to fire the missiles).⁶

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 submarine in the class, HMS *Vengeance*, entered service in Feb. 2001. Mills, C., ‘Replacing the UK’s strategic nuclear deterrent: Progress of the Dreadnought class’, Commons Briefing Paper CBP-8010, House of Commons Library, 11 Feb. 2020, p. 9.

³ British Ministry of Defence, ‘Continuous at sea deterrent 50: What you need to know’, 3 May 2019.

⁴ Allison, G., ‘No, America doesn’t control Britain’s nuclear weapons’, UK Defence Journal, 20 July 2017.

⁵ 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.

⁶ British Government (note 1), para. 4.78.

The Trident submarine successor programme

In 2016 the House of Commons approved by a large majority a motion supporting the government's commitment to a replacement of the Vanguard class SSBNs with four new ballistic missile submarines.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. During 2019, programme contractors continued to work to resolve technical problems with the manufacturing of the missile launch tubes to be used in the compartment.⁸

The Dreadnought submarines were originally expected to begin to enter into service by 2028 but this has been delayed until 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.⁹

The replacement of the Trident II D5 missile is not part of the Dreadnought development and acquisition programme. Instead, 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.¹⁰

The 2015 SDSR reaffirmed that the replacement of the current British-manufactured warhead, known as Holbrook, for the Trident II missiles would not be required at least until the 2030s. A decision on a new warhead is to be taken by the current parliament, and work continues on developing replacement options.¹¹ The work includes cooperation between the UK and the USA on 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 Trident Holbrook warhead—which is modelled on the US W76-1 warhead and incorporated into the USA-produced Mk4A re-entry vehicle—in collaboration with US nuclear weapon laboratories.¹³

⁷ British Parliament, House of Commons, 'UK's nuclear deterrent', House of Commons Hansard, col. 559, vol. 613, 18 July 2016.

⁸ British Ministry of Defence, 'The United Kingdom's future nuclear deterrent: 2019 update to Parliament', 20 Dec. 2019, pp. 1–2.

⁹ British Government (note 1), para. 4.65.

¹⁰ Mills (note 2), p. 7.

¹¹ British Ministry of Defence (note 8), p. 2.

¹² British Ministry of Defence (note 8).

¹³ British Ministry of Defence (note 8), p. 3; and Kristensen, H. M., 'British submarines to receive upgraded US nuclear warhead', FAS Strategic Security Blog, Federation of American Scientists, 1 Apr. 2011.

Table 10.4. British nuclear forces, January 2020

Type	Designation	No. deployed	Year first deployed	Range (km) ^a	Warheads x yield	No. of warheads
<i>Submarine-launched ballistic missiles^b</i>						
D5	Trident II	48	1994	>7 400	1–8 x 100 kt ^c	195–215 ^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 Trident 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 The British Government has stated that the process to reduce the stockpile to 180 warheads is under way. Although some sources suggest that the stockpile remains at 215 warheads, it is possible that, under this process, the stockpile may have already been reduced to 195 warheads. Of the total warheads in the stockpile, 120 are operationally available.

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

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 2018 the UK's National Audit Office (NAO) reported that the MOD was facing an 'affordability gap' of £2.9 billion (\$3.9 billion) in its military nuclear programmes between 2018 and 2028.¹⁵ The MOD's budget for 2018–19 received an additional £600 million (\$800 million) from the contingency fund to keep the Dreadnought programme on schedule.¹⁶ In its annual update to parliament in December 2019, the MOD reported that a total of £7 billion (\$8.9 billion) had been spent on the programme's development, design and early manufacturing phases.¹⁷

In January 2020 the NAO reported that three key nuclear-regulated infrastructure projects in the UK's nuclear weapon programme faced delays of between one and six years, with costs increasing by over £1.3 billion (\$1.7 billion) to a forecasted total of £2.5 billion (\$3.2 billion).¹⁸ Specifically,

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

¹⁵ 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 2018–19 defence budget.

¹⁶ Mehta, A. and Chuter, A., 'UK releases extra funding, but military relevancy challenges remain', *Defense News*, 29 Mar. 2018.

¹⁷ British Ministry of Defence (note 8), p. 3.

¹⁸ British National Audit Office, *Managing Infrastructure Projects on Nuclear-regulated Sites*, Report by the Comptroller and Auditor General (NAO: London, 10 Jan. 2020), pp. 5–6.

the report identified the work under way to enhance or replace existing facilities at the shipyard in Barrow-in-Furness in Cumbria, where the four Dreadnought class SSBNs are being built. The other projects involved the development of cores for a new generation of nuclear reactors to power the Dreadnought submarines and the construction of a new warhead assembly and disassembly facility (MENSA) in Berkshire to be operated by the AWE. The NAO report attributed the rising costs and delays to poor project management and insufficient oversight by the MOD.¹⁹ It set out a series of recommendations to address identified shortcomings. However, the report also noted that some of the increased costs reflected the need for the MOD to comply with stricter security and safety regulations for the nuclear industry.²⁰

¹⁹ British National Audit Office (note 18), p. 8.

²⁰ British National Audit Office (note 18), p. 13.