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## Components:

In 1993, four Vanguard-class submarines were commissioned. Each submarine is based at Her Majesty's Naval Base Clyde in Faslane in Scotland.



HMS Vanguard

Each Vanguard-class submarine can carry 16 Trident II (D5) submarine-launched ballistic missiles (SLBMs). The missiles were developed in the United States by Lockheed-Martin. They have a range of approximately 4,600 miles and are accurate to within 100 metres. Britain bought 58 missiles as part of a joint programme with the US. The pool at King's Bay, Georgia – home to many Ohio-class submarines that employ Trident II – is also used for Vanguard. It has 50 left after test-firings. The missile was first deployed by the U.S. Navy in 1990.



Trident missile test flight

The United States has initiated a life extension programme to increase the service life of the Trident II missiles from 30 to 45 years. Trident missiles will be fully withdrawn from service in 2042. The UK is also participating in this programme.

Each Trident II missile can deliver 12 independently-targeted warheads, giving each Vanguard-class submarine the capability to deploy 192 warheads. In practice it is British Government policy to deploy no more than 48 warheads per submarine and probably around 12 missiles per submarine with 3-4 warhead each. Trident missiles are not serviced in the UK but are returned to the United States Strategic Weapons Facility Atlantic, at Kings Bay in Georgia, for periodic refurbishing.

## ▶ The warheads

The warheads carried by the Trident missiles are manufactured and designed in the UK by the Atomic Weapons Establishment. They are closely based on the 100 kiloton American W-76 warhead design used for the U.S. Trident fleet. By comparison, the bomb that destroyed Hiroshima was approximately 14kt.

The UK has modified some of its warheads to provide a “sub-strategic” capability with a yield of about 10 kilotons. A few missiles on each submarine are probably armed with a single ‘sub-strategic’ warhead. In 2006 the UK reduced its stockpile of warheads to 160.



U.S. W-76 warheads



## Support infrastructure

**HMNB Clyde:** Home to the Faslane submarine base and the Royal Naval Armaments Depot Coulport. Faslane is home to the *Vanguard* submarine fleet and the smaller *Swiftsure* nuclear-powered attack submarines. Warheads and missiles are stored at Coulport for loading and unloading on to the *Vanguard* submarines.

**Atomic Weapons Establishment (AWE) Aldermaston and Burghfield:** Aldermaston is the centre for British nuclear warheads design, testing and production. It is owned by the Ministry of Defence but is contractor operated by a consortium on SERCO, BNFL and Lockheed Martin. Burghfield is responsible for the final assembly of warheads, their in-service maintenance and their eventual decommissioning. After assembly warheads are transported to Coulport by road.

**HMNB Devonport:** The *Vanguard* submarines undergo a major 2-year refitting and refuelling at Devonport in Plymouth during their service life.

**Rolls Royce:** The nuclear power plants and nuclear fuel rods that drive the *Vanguard* submarines are designed and manufactured at Rolls Royce’s Raynesway plant in Derbyshire.

**BAE Systems:** The *Vanguard* submarines and the proposed successor submarines are built at BAE Systems shipyard at Barrow-in-Furness, the UK’s largest shipyard. Barrow is currently building the new *Astute*-class nuclear-powered attack submarine.

**Ministry of Defence:** Nuclear policy planning and targeting functions are carried out by the Ministry of Defence’s Director Chemical, Biological, Radiological and Nuclear Policy in the policy department and the Strategic Targeting Centre in London. *Vanguard* submarines are controlled through the Royal Navy’s Commander-in-Chief Fleet operational HQ in Northwood supported by MOD’s Strategic Systems Executive in Bath.



AWE Aldermaston



Faslane submarine base