

Future options for British nuclear weapons

Summary

There are problems with all the obvious alternative nuclear systems that Britain might deploy instead of Trident. Developing a new system would signal to the world that the UK intends to keep nuclear weapons indefinitely. Any alternative would be expensive and would require American help. There is no certainty that the US will develop and produce future submarine-launched and air-launched cruise missiles.

Instead of acquiring any new system, Britain should identify a number of steps towards disarmament and should implement them. A key first measure would be to end Continuous at Sea Deterrence (CASD). This would remove the need for an urgent replacement decision and bring many other benefits. The number of warheads could be reduced to one each on a smaller stock of missiles as a temporary measure. A series of steps should be taken to de-mate, disassemble and destroy nuclear warheads and ~~in due course~~ the facilities at the Atomic Weapons Establishment should be dismantled.

Product → *shut & fail* *Funk* *diversity to other*

Alternative nuclear systems

Nuclear-armed Astute

There are two principle ways that Astute class submarines with nuclear cruise-missiles could be deployed:

- Continuous At Sea Deterrence (CASD) with one Astute class submarine at sea at all times. This would require at least three additional submarines. Several submarines would be dedicated to a nuclear role.
- A nuclear-capability on Astute without maintaining CASD. This could involve building one or two additional submarines, or ~~even~~ by adding a nuclear capability to two of the seven submarines that are already planned.

Option a may cost a similar amount to Trident. The savings in submarine build costs would be offset by expenditure on missile and warhead development.

Option b would be cheaper. However, as Admiral Lord Boyce has pointed out, if CASD is to end in 2024 then it should stop now. Submariners cannot be asked to go through all the inconvenience of keeping a submarine on patrol today, if they know this will soon be abandoned.

But if CASD is ended now then, rather than developing cruise missiles for Astute, the life of the Vanguard class can be extended, and any replacement decision postponed (see below).

There is no reason to be the future of
(Developing a suitable nuclear-armed cruise missile for Astute would be no easy task.) The US Navy has not deployed the Tactical Land Attack Missile – Nuclear (TLAM-N) at sea since 1992. The missiles are currently due to be phased out in 2013. (The US Navy is not enthusiastic about TLAM-N and has given them a low priority.) The Schlesinger report argued that, despite this, a programme started to

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CCOM, J2004
US Navy not satisfied
→ in line of agreed
by NPR - may not appear

replace these missiles.¹ However this recommendation may not be implemented. The future of TLAM-N will probably be clarified when the Nuclear Posture Review is completed at the end of 2009.

TLAM-N is based on the earliest model of the Tomahawk missile. While it has a longer range, it is less accurate and less reliable than newer cruise missiles. This unreliability would complicate nuclear strike planning. There would be a serious risk that a nuclear warhead might land on a friendly or neutral country that was close to or on the flight path.

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Developing a new British cruise missile with a new British warhead is probably not a realistic option. It may be feasible to work with US companies to modify an existing or proposed US missile design. The nuclear version may need to be able to operate without GPS, which is vulnerable in a nuclear war, and which is a key component in newer cruise missiles. (Assistance would be required from US Laboratories in modifying a British warhead.) These developments would not be cheap, particularly if there was no live American programme to develop a successor to TLAM-N.

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TLAM-N uses a unique command and control system on the submarine which supplements the launch equipment for conventionally-armed missiles. A new or modified system would be required for Astute.

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The UK has a cruise missile targeting cell at Northwood and this could be modified for a nuclear role. For long-range missions the targeting cell may rely on information from US satellites, raising questions about the operational independence of a cruise-missile based system.

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TLAM-N was excluded from the Intermediate Nuclear Forces Treaty in 1987. However the US and Russia subsequently agreed to end their deployment at sea. Since 1992 Washington has issued an annual statement to this effect. A British proposal to start patrols with these missiles is unlikely to be seen as a constructive contribution to disarmament, even if it replaced the more potent Trident force. Washington might not support the proposal, or might insist that British missiles were kept in storage and not deployed at sea.

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Producing a new warhead would involve substantial costs. American TLAM-N missiles are armed with the W80 warhead. The Life Extension Programme (LEP) for W80 was cancelled in favour of the now abandoned Reliable Replacement Warhead. The W80 LEP may be revived, but not in the near future. The W80 has not been adapted for more modern cruise missiles. Aldermaston could be faced with developing a new or modified warhead for which there was no direct US counterpart.

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When British Ground Launched Cruise Missiles (GLCMs) were under discussion in 1979, Aldermaston said that they had two warhead designs that might be suitable.² However these options may not meet modern safety and security standards. In the 1980s a British warhead was tested and developed for the Tactical Air to Surface Missile (TASM), but it was never produced.

by
factors

Adapting the UK Trident warhead for a cruise missile would involve producing a new Arming, Fuzing and Firing system and reconfiguring the components to fit the different space and weight constraints. Weaponising a warhead to fit a particular delivery system is often difficult.

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¹ Report of the Secretary of Defence Task Force on DoD Nuclear Weapons Management, Phase II: Review of the DoD Nuclear Mission, Chaired by James R Schlesinger, December 2008.

² A study of a possible new UK contribution to a NATO Long Range Theatre Nuclear Force. Defence Policy Staff, 19 June 1979. The National Archive DEFE 25/335 e64 Annex A

→ if the 2015 projected that the warhead
a new capability beyond 2030 to the mid 2040s
DASD to develop the warhead

Air delivered systems

Any consideration of future RAF weapons will revive unhappy memories within the MoD of the forlorn attempt to find a successor to WE-177 in the 1980s and early 1990s. The WE-177 gravity bombs were considered to be ineffective against an enemy with a modern air defence system. The aircraft would be shot down before they reached their targets. The alternative was to introduce a Tactical Air to Surface Missile (TASM). The RAF planned to use SRAM-T, a short range US nuclear missile. However SRAM-T was abandoned by the US Air Force (USAF) in 1991. Plans for an Anglo-French alternative never came to fruition. Developing a unique British system was considered to be unaffordable.

The USAF has developed two modern nuclear-armed cruise missiles for strategic bombers. The most recent, the Advanced Cruise Missile, was withdrawn from service in 2007. At the same time the number of Air Launched Cruise Missiles (ALCM) was halved. Concept studies have been carried out for a new Enhanced Cruise Missile (ECM) with a nuclear role, to replace ALCM. However the future of this project is not certain. It may be clarified in the forthcoming Nuclear Posture Review.

One issue will be whether or not it would be practical to fit an existing or planned US cruise missile onto any current RAF aircraft. The December 2006 White Paper proposed adapting civil aircraft rather than using existing military planes.

If ECM is cancelled, unavailable or unsuitable then the RAF would have to choose between a cheaper gravity bomb, with little chance of the aircraft reaching its target, or an expensive new missile. The USAF has a third alternative, the B2 stealth bomber, which can be deployed around the world with gravity bombs. However the B2 is not for sale and the UK can't afford to build its own.

American ALCMs use the W80 warhead in a slightly different configuration from TLAM-N. Producing a warhead for an air-launched cruise missile would raise similar concerns as for a submarine-launched missiles. A gravity bomb would be easier to develop. The simplest option, adapting the UK Trident warhead into a gravity bomb, would still involve developing a new Arming and Fuzing unit, weaponising the warhead and a series of safety and delivery tests.

Ground Launched Cruise Missiles

In 1979 the Chiefs of Staff considered whether the UK should purchase Ground Launched Cruise Missiles (GLCM) from the US and equip them with British warheads.³ This would have been in addition to Polaris/Trident and the deployment of American GLCM to Greenham common which was under discussion at the time. The plan for British GLCM was a low priority and was quickly dropped.

US GLCM were withdrawn from Greenham Common and scrapped under the terms of the Intermediate Nuclear Forces (INF) Agreement 1987. Russia is currently interested in internationalising the INF restrictions. Developing GLCM is probably not realistic for both practical and arms control reasons

Land-Based Ballistic Missiles

³ A study of a possible new UK contribution to a NATO Long Range Theatre Nuclear Force. Defence Policy Staff, 19 June 1979. The National Archive DEFE 25/335 e64 Annex A para 80

In the early days of the British Polaris programme MoD officials were briefed by Boeing on the Minuteman missile system. The initial view was that this might be cheaper than Polaris.⁴ However the Minuteman option was not pursued.

The December 2006 White Paper argues that placing 32 Trident missiles in silos across Britain would require a large amount of space and would be more expensive than keeping them on submarines. This would be less the case if only a small number of missiles were deployed. Siting new missile silos could present an insurmountable political problem.

The Belgian model

Belgium has not built any nuclear weapons, but the Belgian Air Force has access, in the event of war, to around 20 American nuclear bombs. These B61 bombs are kept under US custody at Kleine Brogel for use by Belgian aircraft against NATO targets in wartime. It would be far cheaper for Britain to adopt this model than to keep any weapons of our own. There would be no need to maintain the expensive facilities of the Atomic Weapons Establishment. This would not be a new idea for the RAF. For a large part of the Cold War many British aircraft were allocated US nuclear weapons rather than British ones.

Adopting the Belgian model would not be politically acceptable, but considering it helps to identify one problem at the heart of British nuclear policy. The political pressure has been to have an independent nuclear force which shows that, unlike Belgium, Britain is a big player on the world stage. Yet the perception of nuclear independence is an illusion. It is inconceivable that Britain would launch a nuclear attack when the US was telling us not to. A scenario in which America stood on the sidelines, ambivalent about whether or not the UK started nuclear Armageddon, is equally implausible. The reality is that the only feasible scenario in which British nuclear weapons might be used is where they are part of a joint Anglo-American strike. Yet the public have always been persuaded to pay for them on the assumption that they are independent.

A second lesson from the Belgian model is that the B61s in Europe are now widely regarded as mere relics of the Cold War with no relevance to today's world. US European Command (USEUCOM), which has custody of the weapons, does not feel that they serve any purpose.⁵ Des Browne's Top-Level Group recently joined the chorus of voices saying it was time to end their deployment.⁶ But this scepticism should go wider. It is time to accept that nuclear weapons, whether in Belgium or Britain, have no meaningful role to play in NATO policy.

How much life is left in Vanguard Class submarines ?

The MoD argue that the successor submarine project needs to move forward now in order to meet the In Service Date of 2024. This is the date beyond when they assess that they could no longer guarantee to maintain CASD. It is not however the date when all of the submarines would become

⁴ Minuteman as a UK deterrent weapon. JE Henderson, Assistant Chief Scientific Advisor, Air Ministry, March 1963. The National Archive AIR 77/653.

⁵ Report of the Secretary of Defence Task Force on DoD Nuclear Weapons Management, Phase II: Review of the DoD Nuclear Mission, Chaired by James R Schlesinger, December 2008. Page x.

⁶ Nuclear-free world ultimate aim of new cross-party pressure group, Guardian 8 September 2009

completely ineffective. The timeline indicates that HMS Vigilant would remain operational until 2026 and HMS Vengeance until 2028.

Furthermore these dates are calculated on the basis that CASD is sustained from now until then. If CASD was abandoned then it would be possible to extend submarine life by adjusting the way the vessels are deployed. For example one or two submarines could be mothballed.

The key limitation on submarine life is probably the integrity of the reactor pressure vessel which is degraded by the effects of radiation. The lifespan of PWR2 was initially set at 25 years. Studies are underway to extend this by 5 or more years. A key factor will be evidence from the PWR2 prototype at Dounreay. The prototype burns up fuel cores at about twice the rate that occurs on a submarine. By the time this reactor is decommissioned in 2014 it will have been exposed to radiation equivalent to that experience on a submarine in 40 years.

Pursuing a path towards disarmament

Rather than developing an alternative nuclear weapon system to replace Trident, a preferable approach for Britain to take would be to identify a series of concrete steps that can be taken to move towards disarmament. This would have a number of advantages:

Reducing the salience of nuclear weapons

Developing an alternative to Trident will not sit well with claims that Britain is serious about disarmament. Any new system will take several years to develop. It would probably enter service in the 2020s and have a potential lifespan of around 30 years. Even though there may be fewer, less capable weapons, the development of a new delivery system and new or modified nuclear warheads will send the message that this country intends to keep a nuclear capability indefinitely.

If new weapons are acquired on the basis that they are more suited to future threats than Trident, this carries with it the danger that Britain will be seen as moving away from having nuclear weapons as instruments of last resort and towards having more "useable" weapons.

In contrast if a series of steps are identified to de-alert, de-mate, dismantle and ultimately decommission the current Trident stockpile, this will send a strong signal that Britain is serious about fulfilling its commitments under Article VI of the Non Proliferation Treaty and about implementing the 13 steps agreed at the NPT renewal conference in 2000.

Reducing costs

Given our commitments under international law it is not a question of whether Britain will eliminate its nuclear capability, but when. If we retain nuclear weapons until 2050 then it could be argued that it may be cheaper to replace Trident with an alternative system. However if, following a series of unilateral and/or multilateral steps, Britain abandons its nuclear weapons within the next 25 years then any money spent on an alternative system will have been wasted. It should be possible to stretch the life of a de-alerted Trident force until around 2035.

Flexibility

After identifying a series of steps to disarm the current system there can be some flexibility in the timescale within which this plan is implemented.

There would be clear advantages in moving quickly – this would have the most immediate international impact, would be the most ethical position to adopt and would save the most money.

Nuclear weapons are not the answer to any of Britain's security concerns in the foreseeable future. Arguments that Britain needs nuclear weapons because of terrorism or because of Iran do not stand up to close scrutiny. Nevertheless they are widely held. The constraint on radical change is not that nuclear weapons could be a rational answer to future problems, but that some people believe that possessing them is linked to national status.

It would be possible to adjust the timescale of disarmament so as to retain public support and also to maximise the impact on international disarmament.

Practical Steps Towards Disarmament

End CASD

The 13 steps agreed at the NPT Review Conference in 2000 include a call for "concrete agreed measures to further reduce the operational status of nuclear weapon system". There is scope for Britain to move beyond the two non-verifiable changes that were made in the 1990s – removing target data from the missiles, but not the onboard computers, and reducing the alert state to several days.

CASD should end as soon as possible. The current posture is designed to maintain a nuclear force which could never be destroyed before it could launch its missiles. But the concern about a "Bolt from the Blue" attack bears no relation to the current situation where there is not only no current threat, but also no likely threat in the near future.

It has been argued that if CASD was ended, then sending a boat back to sea in a crisis would heighten tension. But it could work the opposite way. It can be argued that sending a submarine to sea might be seen as a signal, a show of resolve, and help to defuse a crisis.

Ending CASD would bring a number of benefits. It would:

- a. Reinforce international moves to reduce the alert state of nuclear forces around the world.
- b. Increase the potential life of the Vanguard class Trident system, reducing the pressure for a quick replacement decision.
- c. Reduce the operating costs of the submarine force. Double crewing, where submarines have a Port and Starboard crew which alternate on patrols, could be ended.
- d. Reduce the manpower pressures on the submarine service.
- e. Enable submarine training and logistical support to be conducted on a more efficient schedule.
- f. Be possible for other countries to verify the lowered alert state.
- g. Open up the possibility of removing the warheads and storing them on shore.

Scaling Down Trident

*All option, except CASD (After war plan is
near end mission C?) → End CASD now*

It has been argued that Britain should retain a nuclear force which has significantly fewer warheads than at present.⁷ Retaining even a scaled-down force for many years would not be consistent with Britain's commitment to eliminate all its nuclear weapons. However this could be done as a temporary step on the path to disarmament.

When Polaris was first deployed Aldermaston made enough warheads to arm all four submarines. When Chevaline was introduced the stockpile was reduced to the number required for three submarines.⁸ The current stockpile of 160 operationally-available Trident warheads is sufficient to arm three submarines with 48 warheads each.

In practice there are often only two Trident submarines which are armed with missiles and warheads. For example this has been the case for half of the time over the last five years, because of the refit cycle. The stockpile of operationally-available warheads could easily be reduced to the number required for two submarines.

A significant issue in US-Russian arms control agreements has been de-MIRVing, reducing the number of warheads on each missiles to one. American and Russian land-based missiles have been de-MIRVed, but their submarine-based missiles are still permitted to carry several warheads. Britain could de-MIRV our Trident missiles. Although each submarine has 16 missile tubes they normally only carry 14 missiles. So Trident could be scaled-down to 28 missiles on two submarines, each with a single warhead.

Since 1998 the number of warheads deployed on submarines has fluctuated between 96 and 144, depending on whether there were two or three armed submarines. Reducing this to 28 would mean disassembling around 116 warheads. This would take around 3 years to carry out.⁹

Additional steps

Demating nuclear warheads

Nuclear warheads can be removed from Trident submarines in the Explosive Handling Jetty at Coulport and stored on shore. This would be easy to verify, would reduce the risk of an accident and would simplify security. Reloading 14 warheads onto a submarine in Coulport would take several days. De-mating can be linked with ending CASD, particularly if the alert state is reduced to one measured in weeks or months, consistent with the notice of NATO nuclear capable aircraft.¹⁰

Coulport also has bunkers which can store 16 Trident missiles. Removing missiles from all submarines would reduce the potential consequences of an accident. This would be sufficient to arm two submarines with 8 missiles each.

⁷ Abolishing Nuclear Weapons, George Perkovich and James Acton, Alephi Paper, IISS, October 2008

⁸ The reduction was made when Chevaline was introduced in order to simplify the production of warheads. Components from the fourth batch of Polaris warheads were recycled for the first batch of Chevaline warheads.

⁹ The Nuclear Installations Inspectorate (NII) has expressed concern about the safety of the current assembly/disassembly facility at Burghfield. However it has recently permitted live work to restart. It is possible, but unlikely, that the NII might insist that the disassembly of a large number of warheads should be postponed until 2016, when a new assembly/disassembly facility (Project Mensa) is due to be completed.

¹⁰ NATO dual capable aircraft are now on an alert state measured in months.

Disassembling nuclear warheads

Nuclear warheads can be disassembled into their main components at Burghfield. A small number of non-nuclear components are destroyed during disassembly and others, such as the High Explosive, have a relatively short shelf-life. So long as a stock of these components is maintained, it would be possible to reassemble the warheads. Re-assembling 14 warheads could be completed in 5-6 months if the assembly facility was kept at a high state of readiness.

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Destroying nuclear warhead components

The disassembled components can be destroyed or modified so that they cannot be reassembled. For example plutonium pits can be melted down. The Atomic Weapons Establishment could be maintained on a care and maintenance basis. Remanufacturing 14 warheads could take around 2 years.

change

Decommissioning Aldermaston

The facilities used to design and build nuclear weapons at Aldermaston and Burghfield could be decommissioned. It would take several years to restore a nuclear weapon production capability.

These additional steps could all be considered as part of a Virtual Nuclear Arsenal approach.

These additional steps could all be considered as part of a Virtual Nuclear Arsenal approach.

*May still + capabilities have potential
system - by direct models into
type assets; industrial use of market assets;
Support for con def + arms race, &
vulner + non-pit, could be spread
+ copy into US system with copy assets
or day of war.*

Others