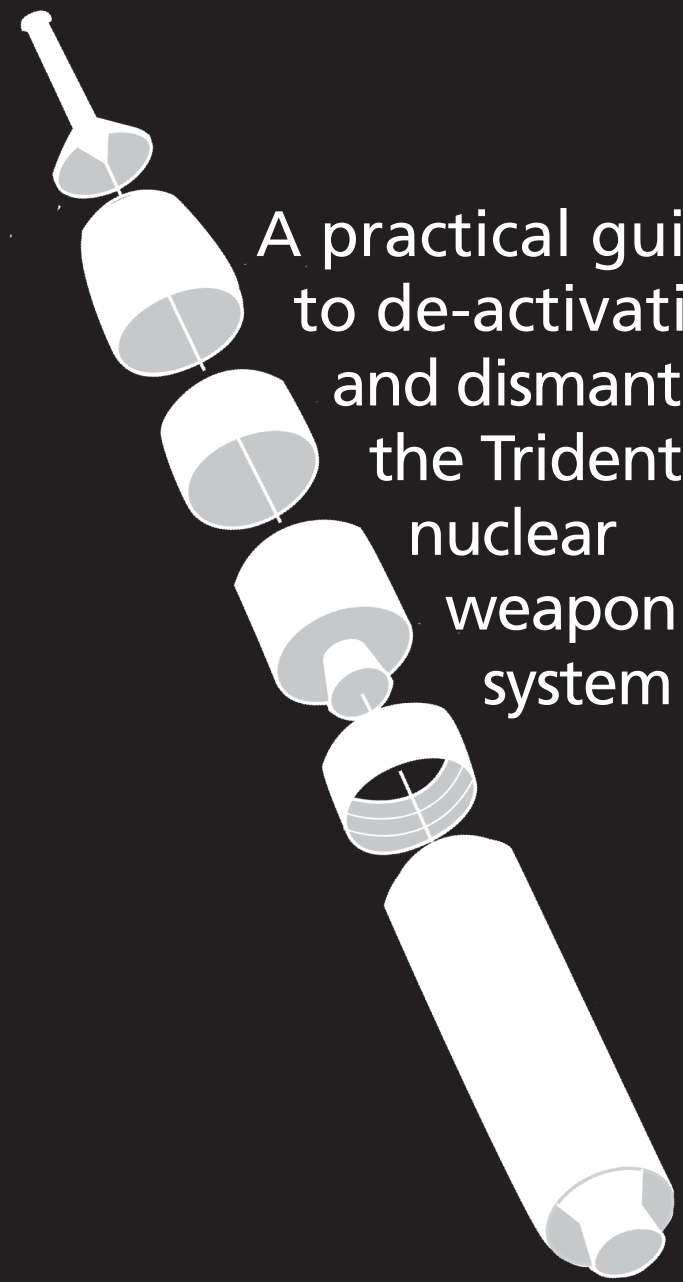
Disarming Trident



A practical guide to de-activating and dismantling the Trident nuclear weapon system

A briefing by the Campaign for Nuclear Disarmament

CND

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Disarming Trident

Introduction

This report explains that disarming Trident is not an impossible task and outlines how this process can be achieved in eight specific phases over four years.

The report also details how independent verification of the procedures, to provide assurance to the international community, could be carried out.

Disarming Trident timetable	
Phase One	End operational deployment from Her Majesty's Naval Base, Clyde
Phase Two	Remove the key and trigger necessary to launch a Trident missile
Phase Three	De-activate missiles by removing target components
Phase Four	Remove the nuclear warheads from the submarine
Phase Five	Remove the missiles from the submarine
Phase Six	Disable the nuclear warheads by removing key components
Phase Seven	Transfer the warheads from HMNB Clyde to the Atomic Weapons Establishment (AWE), Burghfield
Phase Eight	Dismantle the warheads at AWE, Burghfield

WITH the UK government's National Security Strategy (2010) downgrading the risk of a state-on-state nuclear attack, the justification for Britain spending billions on an outmoded weapons system has evaporated, particularly in the context of the deepest public spending cuts in British history. Recent years have seen the consensus in Westminster crumble, with defence analysts recognising both the crippling impact on conventional defence spending of retaining and replacing Trident, and the strategic redundancy of nuclear weapons.

The coalition government's refusal to reconsider Trident replacement during the Strategic Defence and Security Review process has resulted in limited debate in Parliament. The Opposition front bench is currently failing to ask serious questions about the programme and the Defence Select Committee has not so far conducted an inquiry. Questions and debates are limited to those motivated by the most concerned backbenchers.

But this has not prevented a growing debate outside Parliament. There is now widespread support for British nuclear disarmament. Many civil society organisations, including trade unions, faith communities and students, denounced Trident replacement and favour the scrapping of the existing system. Opinion polls clearly show that this opposition is the mainstream view.

This opposition and debate has been reflected in the wider political arena. Prior to – and during – the general election, Sir Menzies Campbell's Policy Options for the future of the UK's nuclear weapons document provoked discussion not only within the Liberal Democrat party, but also within wider policy circles.[1] The issue has been taken up by Nick Ritchie in his *Rethinking Options for Trident Replacement*[2] in June 2010, by Malcolm Chalmers for RUSI in his *Continuous At-Sea Deterrence: Costs and Alternatives*[3] paper in July 2010, and in BASIC's ongoing Trident Commission[4]. Further questions have been asked by CentreForum's *Dropping the Bomb*[5] report. And behind the scenes at the heart of government there is now an Alternatives Review into Trident taking place.

Amongst the alternatives considered in the various reports have been: 'Trident-lite' – maintaining the same continuous operation with three rather than four submarines; the ending of continuous at-sea deterrence; and 'threshold status', alternatively called a 'virtual' or 'recessed deterrent', where the UK would take a number of steps down the disarmament ladder to a situation where it would maintain a nuclear weapon capability but not the weapons themselves.

At the launch of the Trident Commission, Nick Harvey MP, then Defence Minister leading the Trident Alternatives Review, said he could find very little detailed argument from government officials justifying the UK's doctrine of

continuous at-sea deterrence. In *Dropping the Bomb*, Toby Fenwick suggests threshold status, retaining the capability to produce and deploy a nuclear weapon at twelve months' notice, in the event that a credible nuclear threat to the UK emerges. Campbell's Policy Options called the threshold option 'a radical departure for British nuclear weapons policy' which would require 'retention of expertise at AWE and some form of delivery plan'.[5]

Disarming Trident is a step-by-step guide, outlining in eight phases, a procedure for de-activating and dismantling Trident. It is an introduction to how the UK could step down the nuclear ladder.

Some of these steps have been proposed elsewhere. For example, ending continuous at-sea deterrence is an essential first phase. In addition, this report introduces a number of ways to ensure that the Trident system cannot be used in anger.

Additional steps should be taken to ensure the Atomic Weapons Establishment loses its capability to manufacture nuclear weapons. Instead, it should expand its role as a global centre for disarmament and verification.

There is growing opposition to the cost of Trident and its replacement. There is also increasing criticism of the 2010 Strategic Defence and Security Review. The issue of Scottish independence puts the future of the British nuclear weapons' programme in doubt, whatever the outcome of the 2014 referendum. So it is time that policy makers started to get to grips with the practical steps that will need to be taken to achieve disarmament.

This report does that, and in doing so, is designed to explain how nuclear disarmament can be realised.

Timetable for nuclear disarmament

Starting point

Trident consists of four Vanguard class Royal Navy nuclear submarines. There is always one submarine undergoing refit at Devonport. The remaining three vessels are normally armed with Trident missiles and nuclear warheads. One submarine is deployed on patrol. This study assumes a starting point where one vessel is on patrol, the second is on trials and the third is berthed at Faslane.

Phase One

Phase One – End operational deployment of submarines

UK Trident submarines carry out operational patrols, fully armed, which last around 10 weeks. The vessel on patrol is formally on 'several days' notice to fire. At any time the alert state could be covertly raised to 15 minutes notice to fire and remain at this higher state for the duration of the patrol.

The first step that could be taken would be to end the current practice of continuous patrols and to stop all operational deployment of Trident submarines.

Nuclear submarines can travel long distances at speeds greater than 20 knots. The submarine on patrol could return to Faslane within about 7 days.

Phase Two

Phase Two – Remove keys and triggers

To launch a Trident missile, the Captain turns a key and the Weapons Engineering Officer (WEO) presses a trigger. The key and trigger are kept in separate safes on the submarine. As an initial disarmament step, these keys and triggers could be identified, removed from all submarines and stored in a secure site on shore. This could be carried out immediately for the submarine berthed at Faslane, and shortly after each of the other two vessels returned to port.

Inspectors could place seals on the appropriate parts of the Fire Control System and the storage site. Continuous monitoring could be established at the storage site.

Phase Three

Phase Three – De-activate missiles

There is a hatch in each missile tube which enables technicians to replace certain components on the missile while it is on the submarine. These parts include the guidance system and flight control system. Spare guidance and flight control components are stored in the Strategic Weapon System (SWS) building at Faslane. If these parts are removed then the missile can no longer be deliberately launched at any target.

These components are replaced on a routine basis. Following the Strategic Defence and Security Review of 2010, each Vanguard class submarine carries eight Trident missiles. The removal of vital components from one missile takes around 90 minutes. Eight missiles could probably be de-activated within one day.

Similar components could be removed from any spare missiles stored in the Ready Issue Magazines at Coulport. Inspectors could set up seals on the missile access hatches. The components could either be stored in the existing room within the SWS building at Faslane or at another suitable site. Seals and continuous monitoring could be set up at the store.

Phase Four – Remove nuclear warheads from submarines

Phase Four

Coulport has the facilities and equipment required to load and unload nuclear warheads from Trident missiles. It retains a team of specially trained and experienced personnel to carry out this work. To remove the warheads, each submarine would be taken, in turn, to the Explosives Handling Jetty (EHJ). Once securely berthed in the jetty, the warheads would be removed from the missiles while they were on the submarine.

Current practice is that the unloading of all the warheads on a submarine takes place once every three years, in the pre-refit period. Complete loading also takes place once every three years, at the end of the post-refit work up. In addition, small numbers of warheads are removed from one or two missiles several times each year, when operational submarines dock in the EHJ.

The removal of all 40 warheads from one submarine would take between 7 and 10 days. In theory 120 warheads could be removed from the three armed submarines within one month. In practice this may take longer. There are detailed safety and security procedures for de-mating warheads from missiles and for moving warheads between the EHJ and the Re-entry Body Magazines (RBMs) at Coulport. Additional preparation and training may be required prior to conducting unloading on the scale required. This could increase the total time required to 8 weeks. Inspectors could monitor the unloading process and establish seals and monitors in the RBMs.

Phase Five – Remove missiles from submarines

Phase Five

Missiles can be removed from submarines in the EHJ. The Ready Issue Magazines (RIMs) at Coulport can only store 16 missiles. Each submarine currently carries 8 missiles. It should be possible to store the missiles from two submarines, separately from the nuclear warheads, on-shore at Coulport. This would leave a further 8 missiles on the third submarine.

Removing missiles from one submarine could take up to one week and would only take place after warheads had been removed. Inspectors could seal and monitor the 16 missiles which had been moved into the RIMs. Monitoring the remaining unarmed missiles on the submarine would be more difficult.

Phase Six

Phase Six – Disable nuclear warheads and remove Limited Life Components

A Trident warhead contains three Limited Life Components (LLCs): the Arming, Fuzing and Firing System, Gas Transfer System and Neutron Generator. These items are routinely replaced in the Re-entry Body Process Building (RBPB) at Coulport. Removal of these LLCs would disable the warheads. The weapon cannot be triggered without the Arming, Fuzing and Firing System and the Neutron Generator. Removing the Gas Transfer System would substantially reduce the warhead's yield. The removal of LLCs from Trident warheads would render them ineffective.

In addition to the 120 'operationally-available' warheads, which are be deployed on submarines, there are around 100 additional warheads at Coulport. In line with US practice, it is likely that some of these spare warheads will not have their LLCs fitted.

Removing LLCs from the entire warhead stockpile at Coulport might take around one year.

The LLCs are less dangerous and easier to transport than the warheads themselves and could be removed for dismantling more quickly.

Phase Seven

Phase Seven – Remove nuclear warheads from HMNB Clyde

The physical removal of nuclear warheads from the Clyde would be a clear and significant step.

When Chevaline warheads were withdrawn from service in the 1990s they were initially stored at RAF Honington in Suffolk, prior to being dismantled at Burghfield. RAF Honington is the home base and depot for the Ministry of Defence's Chemical, Biological, Radiological and Nuclear Defence Wing which is trained in the detection, identification and monitoring of nuclear, biological and chemical weapons. There are also 25 bunkers in the nuclear weapons storage area at Honington.

Assuming the nuclear store at Honington is not currently operational, a number of steps would be required to re-activate it. These would include reviews of safety and security, improved security measures and the deployment of a small team of warhead experts from Coulport and Aldermaston/Burghfield.

Nuclear weapons are routinely moved between Coulport and AWE Burghfield in convoys. It would require around 25 convoys, with an average of 8 warheads each, to transport the entire stockpile to Honington and/or Burghfield. In the 1980s and 1990s there were periods when convoys were travelling regularly to Scotland once every four to six weeks. During this time additional convoys were transporting nuclear weapons around England. If convoys were travelling at four week intervals then it would take two years to remove the entire stockpile.

Phase Eight – Dismantle nuclear warheads

The only site in the UK that can disassemble nuclear warheads, including their Nuclear Explosives Package, is AWE Burghfield. There are four assembly/disassembly cells in the existing facility. AWE is building a replacement building, Project Mensa, which will enter service in 2016. It will have a similar capability and probably four assembly/disassembly cells.

Dismantling a Trident warhead at Burghfield would involve the following steps:

1. Prepare cells for disassembly
2. Inspect warhead
3. Remove Re-entry Vehicle shroud
4. Cut and disconnect detonator cables
5. Remove firing set and neutron generator (if not removed at Coulport)
6. Cut open and remove radiation case
7. Remove primary (fission stage)
8. Remove secondary (fission stage)
9. Prepare for removal of High Explosive (primary)
10. Remove High Explosive (primary)
11. Package plutonium pit (primary)
12. Dismantle secondary

WE-177 nuclear bombs were initially produced at annual rates of between 24 and 36 per year. In 1981 it was assumed that Trident warheads would be manufactured at a rate of up to 60 per year, although assembly probably peaked at around 40 Trident warheads per year. WE-177 and Chevaline warheads were all dismantled by 1998 and 2002 respectively. Disassembly rates for these two weapons were probably between 20 and 40 per year.

These rates were achieved while Burghfield was assembling, refurbishing and disassembling more than one type of warhead at the same time. If all four cells were set up for Trident disassembly then higher rates, perhaps 50-60 warheads per year, could be achieved. On this basis, it would take around 4 years to dismantle the current stockpile of less than 225 warheads.

The output from disassembly at Burghfield would be the separated components of a nuclear warhead, including the plutonium pit. Further work would be required to convert the pit into a form where it could not be reconstituted into a nuclear weapon.

Additional steps

Two further measures could be taken:

1. Return of Trident missiles to the US

The D5 missiles were initially loaded onto British submarines at the US Navy Trident facility at Kings Bay, Georgia. They would have to be returned to this site, or possibly the US Navy's other Trident base at Bangor in the Pacific. D5 missiles are currently only transported by sea on Vanguard class submarines.

As an alternative, it might be possible to dismantle Trident missiles at Coulport and then to destroy the components. However this would require the construction of new facilities on the site.

2. Dismantling Vanguard class submarines

Some Trident-related equipment on submarines could be dismantled while the vessels were at Faslane. For example, much of the Fire Control System and replaceable elements of the launch system could be removed.

The fuel core in the reactor of a Vanguard class submarine reactor can only be removed at 9 Dock in Devonport dockyard. The fourth Trident submarine HMS Vengeance is in 9 Dock for a three year refit and refuelling which began in 2012. After this, the MoD plans to carry out refits, without refuelling, on some of the other Trident submarines. This refit programme could be replaced with the defueling and decommissioning of these vessels.

Questions of where and how the final dismantlement of nuclear submarines should be carried out are the subject of the Ministry of Defence's Submarine Dismantling Project.

Verification

Norway, Russia, the US, the UK, the IAEA and NGOs have all been involved in research into how to verify that nuclear disarmament has taken place. Most of this work has focused on dismantling nuclear warheads (Phase 8). The principles which have been established can also be applied to the earlier steps.

Britain and Norway collaborated in three exercises, between 2007 and 2011, which explored how a Non-Nuclear Weapon State (NNWS) could verify that another country had dismantled its nuclear weapons. This UK-Norway Initiative[6] was founded on the principle that NNWS can play an important role in verifying disarmament.

There is an underlying conflict between the NNWS's requirement for evidence and the Nuclear Weapons State's desire to keep information secret. In the case of the UK Trident system, this is complicated by the fact that many of the classified components are of US origin.

Information barriers

The UK-Norway Initiative established that it is possible for two parties to agree on an Information Barrier which would indicate whether or not a package contained a nuclear weapon without disclosing classified details of the weapon.

With regard to ending the deployment at sea of Trident submarines (Phase 1), it is easy to monitor the movement of Trident submarines in and out of Faslane and Coulport. This would provide a basis for establishing that continuous patrols had ended. It would be harder to prove that vessels were not carrying out occasional ad-hoc patrols.

Verification of the initial de-activation steps, removal of keys/triggers and missile components (Phases 2 and 3), might be limited. It would be feasible to establish a process of identifying these items, numbering them and placing them in monitored storage. However, these components are classified. An inspector would be unable to verify that each item was what it appeared to be. Radioactive monitoring would not be effective, because the parts don't contain nuclear material. Further research could be done, in advance, to develop a process which would improve the inspectors' confidence, without disclosing classified information.

Trident missiles can carry a mix of warheads and inert re-entry vehicles (RVs). The latter are added to swamp the Moscow anti-ballistic missile system. The inert re-entry vehicles look very similar to a warhead. With regard to the US Trident system, the START agreement allowed Russia to occasionally inspect a sample of submarines and to check whether there were missiles in specific launch tubes. The agreement did not, however, provide a way that Russian inspectors could check how many warheads were on each missile.

This suggests that it would be difficult for an external inspector to count the warheads on a UK Trident missile. However, an inspector could verify that all warheads and inert RVs had been removed (Phase 4). To do this, the nose-cone of the missile would be removed and shrouds placed over the third stage and the Release Assembly fittings. In this way, it would be possible to show that there were no warheads or inert RVs present, without disclosing classified information about the missile's design.

Building confidence in verification measures

There is a second way in which the removal of warheads from a submarine could be verified. An Information Barrier, as proposed in the UK-Norway Initiative, could be used to confirm when warheads were moved out of the Explosives Handling Jetty at Coulport, after unloading. This technology would enable the NNWS to discriminate between nuclear warheads and inert re-entry vehicles without inspecting them visually.

Monitoring warheads from when they were taken off each submarine would give greater confidence that later disarmament measures were comprehensive. This would establish the Chain of Custody at an early point in the process.

Removal of missiles from submarines into the Coulport Ready Issue Magazines (Phase 5) would require a level of access similar to that which the United States gave to Russian inspectors under the START agreement.

Monitoring the removal of the Tritium Reservoir, one of the Limited Life Components (Phase 6) should be possible, because it contains radioactive material. An external inspector should be able to distinguish between a box containing a real tritium reservoir and a similar box which does not, without seeing the reservoir itself. The Neutron Generator contains a small amount of tritium and so the same approach might be possible. Identifying Arming, Fuzing and Firing systems, without classified access, would be more difficult.

The removal of nuclear warheads from Scotland (Phase 7) could be verified using an Information Barrier. This would allow an NNWS inspector to verify whether or not a container held a warhead, before it was placed in a lorry.

The verification of warhead disassembly (Phase 8) has been the focus of significant research. A 1997 US study[7] concluded that 'moderate inspector confidence in the dismantlement of a nuclear warhead is achievable without the need for two sides to engage in an exchange of classified information'.

In May 2002 the UK carried out an exercise which demonstrated that external inspectors could be given Managed Access to the warhead assembly and disassembly site at Burghfield. In a subsequent paper the UK concluded that 'managed inspector access to sensitive nuclear warhead facilities, done properly, is able to permit some degree of access for non-security cleared personnel.'[8]

The first exercises in the UK-Norway Initiative assumed that there was a good relationship and collaboration between the two parties. The third exercise was based on a scenario where there was greater hostility and suspicion. The NNWS had less confidence that disarmament had taken place where the underlying relationship was tense than when it was more friendly.

Some elements of an effective verification regime could be set up more quickly than others. Monitoring the presence of submarines at Faslane would be straightforward. Inspecting a missile, to confirm that all warheads and inert re-entry vehicles had been removed, need not be a complex undertaking. This, and similar steps, would be easier if the United States government took a positive approach to the process. Developing Information Barriers could take some time. Delays to the timetable could be avoided if processes were established and experts identified before Day One. Alternatively, the more robust verification measures might only be introduced in the later stages of disarmament.

Security, heath and safety

There are health and safety risks associated with these disarmament steps. However, the overall effect of this plan would be to reduce risks to the workforce and the general public. Whenever Trident is dismantled, whether sooner or later, there will be risks associated with the movement and disassembly of nuclear warheads. If this is done earlier, then we will avoid the additional risks from keeping the system in service. If Trident is kept on patrol and nuclear warheads are upgraded then the risks will be greater. De-activating and dismantling Trident as soon as possible eliminates these avoidable risks.

The plan to remove all nuclear warheads from submarines within eight weeks and to transport them in a series of convoys over a two year period would raise security issues. However, the risk of a terrorist attack would be lower than normal because this was clearly part of a disarmament initiative.

Conclusion

NUCLEAR DISARMAMENT has been anathema to too many UK politicians – discredited and dismissed as an impossible future. But as the strategic context changes, public opposition grows and pressure mounts outside Westminster, there are signs that minds may finally be opening to a reconsideration of Britain's nuclear weapons possession.

As criticism of the Strategic Defence and Security Review increases, and further cuts are imposed on other military hardware and opposition mounts to the cost of Trident and its replacement, it is necessary that policy-makers understand that nuclear disarmament is a practical and feasible proposition, and that they get to grips with the steps that would need to be taken to scale back the UK's nuclear weapons capability.

This report is designed as a contribution to this rethinking and reassessment process, making nuclear disarmament an understandable – and therefore more realisable – goal for those politicians willing to reconsider the UK's security needs and the possibility of a future without nuclear weapons.

Endnotes

1 *Policy options for the future of the UK's nuclear weapons*, Menzies Campbell, Liberal Democrats, April 2010

2 *Continuity/change: rethinking options for Trident replacement*, Dr Nick Ritchie, Bradford University, June 2010

3 *Continuous at-sea deterrence (CASD): costs and alternatives*, Dr Malcolm Chalmers, Royal United Services Institute, July 2010

4 British American Security Information Council (BASIC): Trident Commission, set up in February 2011

5 *Dropping the bomb: a post Trident future*, Toby Fenwick, CentreForum, March 2012, p.20, Policy options for the future of the UK's nuclear weapons

6 *UK-Norway initiative on nuclear warhead dismantlement verficiation*, Ministry of Defence

7 *Transparency and verification options: an initial analysis of approaches for monitoring warhead dismantlement*, US Department of Energy, May 1997

8 *Verification of nuclear disarmament: second interim report on studies into the verification of nuclear warheads and their components United Kingdom*, Non-Proliferation Treaty Preparatory Committee Working Paper, 2004

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