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Stepping down the nuclear ladder Options for UK nuclear weapons policy

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Overcoming Operational Obstacles to Reduced Readiness

Discussion paper by John Ainslie

1. Introduction

Taking Trident off-patrol should be seen as a valuable step towards disarmament and not as a final goal in itself. In order to encourage decision-makers to have the confidence to make this initial move, this paper considers the practicalities of operating Trident at a lower state of readiness. This should not be interpreted as support for any nuclear alert posture.

2. Submarine fleet priorities

The Royal Navy's submarine fleet carries out a range of functions. In 2008 the tasks allocated to SSN included strategic intelligence, integrity of the UK, Operation Telic and Operation Calash (Gulf) and Falklands Islands Contingency.¹ On several occasions in recent years SSN have taken part in naval task forces deployed around the world. Yet a large proportion of the submarine effort is dedicated to maintaining continuous nuclear-armed patrols. Not only are Trident submarines allocated the highest priority, but providing protection for them remains one of the tasks assigned to SSN.

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The only situation in which it might be argued that continuous patrols by Trident submarines are required would be when there is an actual nuclear threat from Russia, where the US is not willing to commit its nuclear forces, and where the threat of an independent British nuclear response is credible despite being irrational.² The probability of this situation arising is so vanishingly small that it should not be allowed to dictate the nature of submarine operations. Ending continuous patrols would provide an opportunity to rebalance the varied tasks carried out by the whole submarine fleet.

(in operation)

¹ Written Answer by Bob Ainsworth, Hansard, 17 November 2008, Col 156W *replied*

² "[In the event of a nuclear attack] the actual use of our strategic nuclear force in retaliation against the Soviet Union would represent an act of rage and revenge ... there can be no certainty that a Government would take a deliberate decision to launch this act involving the killing of large numbers of enemy civilians but serving no rational purpose". Factors relating to the future consideration of the future of the United Kingdom nuclear deterrent, 1978, The National Archive, DEFE 25-335 E44 part1 (Duff-Mason report) para 11

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3. Reduced alert options

There are a wide range of reduced-alert options. Three factors are the notice to re-deploy submarines, whether submarines are armed with missiles/warheads and whether occasional patrols (armed or virtual) are carried out.

In the 1970s in addition to the Polaris submarine on patrol a second submarine was at 24 hours notice to fire its missiles from its berth and at 47 hours notice to sail from Faslane. It would be possible to replace continuous patrols with a similar high alert state of 24-48 hours notice. This would place high demands on the crew, support infrastructure and protecting forces. The pressures would be reduced if notice were increased to 2- 7 days. NATO nuclear-capable aircraft in Europe are currently on a state of alert measured in months. The demands on crew, infrastructure and protecting forces would be much reduced if Trident were on an alert state measured in weeks or months. This would also introduce the possibility of removing the nuclear warheads. In a de-mated posture, one submarine could be berthed at Coulport on 1 – 4 weeks to sail. If the warheads were in a dismantled state at Aldermaston then the alert state could be 5-15 months.

4. Increasing submarine life

Reducing the alert state introduces the possibility increasing the life of the submarines and so postponing the decision on whether to proceed with the expensive plan to build a successor submarine.

Hull life could be increased by reducing the maximum diving depth of submarines and the frequency they operate close to their maximum depth. This would have some impact on training and operations.

The critical factor determining the life of Vanguard class submarines is thought to be the life of the Reactor Pressure Vessel (RPV). RPV life could be increased by reducing the frequency of power range testing, fast cruise operations and reactor start-ups and by limiting reactor operations in general. Longer periods in refit and maintenance could provide greater confidence in predicted RPV life.

Adjusting the use of submarines in order to increase RPV life would have an impact on training and operations. It would be possible to construct a programme that balanced the desire to increase RPV life with training needs, including sea training. This might look significantly different from the current arrangement. It could involve mothballing one submarine for a period of time.³

³ 13 of the Royal Navy's 44 warships were in mothballs in December 2006 and the Navy planned to increase this to 21. It would take 18 months to return these vessels to service. Website of Julian Lewis MP http://www.julianlewis.net/cuttings_detail.php?id=125

5. Single crewing

In July 2009 there were two crews, Port and Starboard, on HMS Vanguard and HMS Vengeance.⁴ HMS Vigilant, in refit, and HMS Victorious, on a post-refit work-up, had only one crew each. This means that there are two crews which are not on a submarine. In the US Navy the off-crews make extensive use of submarine simulators. The same is probably true at Faslane where there is a similar suite of simulators.⁵

When continuous patrols are ended, the manning level could be reduced to one crew per submarine. The overall time that vessels spend at sea could be reduced without undermining crew competence. For example, over the past year the crews on HMS Vanguard and HMS Vengeance will each have spent around 30% of their time at sea, but the vessels will have been at sea for 60% of the time. With single crewing the number of days these submarines spent at sea could be halved without any reduction in at-sea experience for the crew.

With only one submarine and one crew available it would be possible to maintain a patrol for 16 weeks, the maximum achieved with Polaris. With two single-crewed submarines patrols could be sustained for longer. Alternating patrols would mean that the crews would all spend around 60% of their time at sea. It might prove difficult to sustain this posture. Navy Harmony guidelines are that personnel can be deployed at sea for up to 60% of the time over a three year period.⁶

The pressure on personnel would be eased when a third submarine was available for deployment. In theory three single-crewed submarines could take turns on patrols over a long period. However the requirement for occasional long maintenance periods at Faslane could make it difficult to sustain a simple rotation with three single-crew submarines over several years.

6. Restoring dual crewing

If it was felt that continuous patrols had to be reintroduced over a period of many years, then dual crewing could be introduced. This would be difficult but not impossible. It would take time and would need to be staggered. It might be possible to create one additional crew after 12 months and then a second during the following year. Shore facilities, including simulators, could play an important role in training individuals and teams for the new crews. There would also be a requirement for training alongside and at sea. In projecting how submarine time was allocated in a re-alerted force this need for training new crews would have to be considered along with the requirements of keeping one vessel on patrol, deploying SSN in a protective role, and maintaining the vessels.

⁴ The Fleet Bridge Card for 31 July 2009 shows that HMS Vanguard and HMS Vengeance have two captains (Port and Starboard) while HMS Victorious and HMS Vigilant have only one each.

http://www.rncom.mod.uk/uploadedFiles/RN/Reference_Library/20090731_Bridge_Card.pdf

⁵ The Vanguard Class simulators in service with the Royal Navy include a Submarine Control Simulator, a machinery control room system trainer, a full-scale Fire Control simulator and a PC-based Fire Control simulator.

⁶ Written Answer by Bob Ainsworth, Hansard 11 February 2009

If only the Trident force is considered then the increase would be from 4 to 6 crews. However if the whole submarine fleet is considered then the increase would be from 11 to 13 crews, which might be more manageable. One way of reducing the difficulty of reintroducing double-crewing would be to allocate more personnel to each crew, SSN as well as SSBN.

7. Common submarine skills

There are similar numbers of crews on SSBN and SSN. There are currently 6 SSBN crews and in future there will be 7 SSN crews. SSBN crews are slightly larger. There are some skills, eg those associated with the Trident missile system, which are unique to SSBN and others that are unique to SSN. But many other skills are similar. All submarines have sonar, communications, control, propulsion and tactical weapon systems. Although the particular models vary between classes of submarine.

There are similarities between how SSN and SSBN operate on patrol. Avoiding detection, which is a primary goal for SSBN, is also a major feature of many SSN operations. Trident submarines on patrol must maintain constant communications. On SSN communications may be slightly less of a priority, but they can be required to establish communications from around the world. The Trident missile system requires more accurate and sophisticated navigation systems than those on SSN. SSBN crews are frequently required to carry out missile readiness tests in response to messages from shore. SSN train for and have carried out cruise missile launches which require the receipt and processing of targeting data. Practicing how to attack other vessels is probably a larger component of SSN training than for SSBN.

There is currently some movement of personnel between SSBN and SSN during their careers. However there may be scope to increase this. Increasing the rate of transition between the types of submarine could help to address any problems that arose from morale in a reduced alert Trident force, as SSN carry out a range of challenging tasks. This would require additional training so that more submariners were familiar with the systems on both SSBN and SSN.

8. Submarine training and experience

The submarine training regime involves a mixture of shore training, along-side training and sea training. Submariners are trained in the individual skills they require for their post, in operating within their team, and in working as a crew.

In April 2006 there was a 29% shortfall in Category A & B Nuclear Watchkeepers on submarines.⁷ Ending continuous patrols and dual crewing might ease this problem. However one source of the

⁷ Recruitment and retention in the Armed Forces: Detailed Survey Results and Case Studies, Report by the Comptroller and Auditor General, HC 1633-II 2005/06, 3 November 2006, page 24-27.
http://www.nao.org.uk/publications/0506/recruitment_and_retention_in_t.aspx

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shortage is the lack of opportunities for experience on submarines, which is required for Watchkeepers to move from Category C to Category B.

Ending constant patrols would reduce the experience which submariners have of conducting 10 week patrols. However there could be increased opportunities for deploying the vessels on training exercises which would present different challenges. There would be less experience of keeping an SSBN undetected in peacetime but there could be increased time spent on exercise with other submarines and surface vessels which were actively trying to detect the submarine or operating in support of them.

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Some of the training which submariners receive during an SSBN patrol could be gained as well, or better, in other ways. For example US SSBN take with them on patrol a large number of computer simulations.⁸ These are used by the crew for training during the long hours they spend at sea. They are in most cases identical to packages used in shore training facilities.

While exercises and drills are carried out by SSBN on patrol, the nature of their deployment restricts how these can be carried out. The SSBN on patrol cannot carry out any training routine which would be likely to compromise the location of the vessel. For example a drill which involves surfacing the submarine or transmitting a radio message cannot be carried out in full.

The opportunity to make more flexible use of at sea time and to conduct challenging exercises with other vessels could mean that even a reduced time at sea provided more training value for submariners than time spent on SSBN patrols.

9. Exiting Faslane

In a crisis arose in which it was felt that a Trident submarine should be deployed to sea, the vessel could be vulnerable to attack as it left Faslane on route to its patrol area. The need to sustain these protecting forces on a high state of alert relates only to the perceived threat from Russia. This should relate not just to the Russian Navy's ability to deploy SSN to Scotland, but also to whether there is any serious prospect that Russia is likely to present a threat for which the UK Trident force was relevant. In this hypothetical scenario the issue of vulnerability does not disappear if one submarine is kept on patrol. The question of how to exit Faslane would still arise when there was a need to change the vessel on patrol.

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In the past substantial conventional forces were allocated to protecting SSBN. For example in the 1970s the Royal Navy's entire minesweeping force would have been needed to keep the approaches to Faslane open.⁹ There would have been none left to clear the Channel or the approaches to major ports. After the Strategic Defence Review in 1998 there were still significant numbers of naval

⁸ Submarine On Board Training Catalog; <https://www.netc.navy.mil/sobt/web/catalog/starthere.htm>

⁹ Response to the Soviet Threat to Targets in the UK, Chiefs of Staff, 16 January 1978. The National Archives, PREM 16-1563 and Defence against the Soviet threat to threat to the United Kingdom, 20 February 1978, The National Archives, PREM 16-1563.

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vessels and aircraft assigned to protecting Trident.¹⁰ However by 2007 this had declined. For example in 1998 there were 2 SSN committed to Trident and a 3rd with a contingent role, ie this was one of a number of tasks to which the vessel was assigned. By 2007 there were no committed SSN and only 1 contingent SSN.¹¹ In addition today one destroyer or frigate is at extremely high readiness to support Trident.¹²

An operation to protect a Trident submarine as it leaves the Clyde is carried out at the start of each patrol. If constant patrols are ended then these operations could be replaced by exercises which were scheduled around availability of other vessels, including SSN acting in a hostile role, rather than a fixed timetable. This could provide more opportunities to practice how to exit Faslane when there are forces actively trying to detect the SSBN.

When the alert state was modified in 1998, the MoD said that Trident submarines would be able to take part in exercises with other vessels. However the extent to which this is carried out will be limited by the need to ensure that the location of the SSBN is not compromised. If constant patrols were ended then there would be more scope for SSBN to take part in exercises such as Joint Maritime Courses.

1 If constant patrols were ended, but the force kept on a very high state of alert, 24-48 hours notice, this could place high demands on the protecting forces. It could be argued that one or more SSN at Faslane, Nimrods at Lossiemouth and Sea King helicopters in Cornwall would all have to be on a high state of alert. For this reason it would be preferable to have the SSBN on a low state of alert, this would also make it feasible to store warheads on shore.

10. Submarine maintenance and support

Currently the Vanguard class maintenance schedule is dominated by the need to always have one submarine on patrol. Removing this requirement might result in savings and efficiencies in the support regime. This would particularly be the case where if force was kept at a low, possibly de-mated, state of alert.

→ *typical to SSN*
There have been at least two major generic faults on British submarine reactors. A problem discovered in the PWR1 reactor on HMS Warspite in 1989 potentially affected the entire submarine fleet. All SSN were kept in port but Polaris patrols were maintained. The Navy found it difficult to both sustain continuous patrols and to carry out inspections and repairs on the four Polaris boats.¹³ Then in 2000 a coolant leak on HMS Tireless in the Mediterranean revealed a further fault in the PWR1 design. SSN operations were severely restricted while a programme of repairs was implemented. If Trident were on a reduced state of alert it would be much easier to respond to any similar generic reactor faults which were discovered in the future.

¹⁰ Strategic Defence Review Task MT27 Nuclear Forces

¹¹ Written Answer by Des Browne Hansard 8 March 2007 Col 2131W;

¹² Written Answer by Bob Ainsworth Hansard 17 November 2008 Col 156W

¹³ Cracking Under Pressure: the response to defects on British nuclear-powered submarines, Scottish CND and Faslane Peace Camp 1992. <http://www.banthebomb.org/archives/magazine/cracking.htm>

11. Implications of a de-mated posture

Removing warheads and/or missiles would have an impact on the skills required by shore staff at Coulport. If the warheads were removed then the risk of a warhead accident on a submarine is eliminated during normal times. However to maintain the capability to reload warheads at short notice there may be a need for a larger number of personnel, more highly trained, to carry out operations in the Explosive Handling Jetty. Currently this work is undertaken by around 45 personnel who normally work on other tasks.¹⁴ Warhead loading and unloading is undertaken on a predictable calendar. In a de-mated posture more personnel might be needed to reload warheads within the required timescale. A clear plan would be required to ensure that they are fully trained and regular exercises carried out with dummy warheads.

Marines from the Fleet Protection Group are deployed to provide security when warheads are moved around Coulport and onto submarines. In a de-mated posture adequate security during re-loading would be even more important. This could require additional training and exercises. As with the loading crews, a larger number of marines might be required to be on a high state of alert.

If missiles were removed as well as warheads the risk of a reactor containment failure accident would be reduced. The bunkers at Coulport can store up to 16 Trident D5 missiles, sufficient to load 2 submarines with 8 missiles each.¹⁵ If the missiles were stored on shore there would be an increased need to have a sufficient number of properly trained personnel available to reload missiles and to provide security during their movement.

The Royal Navy has a small number of Active Inert Missiles (AIMs). These are dummy missiles with electronics that mimic those in actual D5 missiles. These were deployed on Trident submarines during their initial trials after construction and are probably also used on post-refit trials. If missiles were removed from submarines then AIMs could be loaded to allow missile crews to carry out training. There might be a case for ordering additional AIMs.

Storing a larger number of warheads, and possibly missiles, at Coulport might require a slight increase in staffing levels and additional training for workers in the armaments depot.

12. Maintaining morale

The White Paper on the Future of the UK Strategic Deterrent said that continuous patrols play an important role in setting a challenging standard which is important for morale.¹⁶ However this has

¹⁴ "For example an electrician may well find himself working as a capstan operator for the duration of the evolution". The Big Picture, Babcock Group Magazine, Winter 2005

¹⁵ These bunkers were built in case there was a need for an emergency docking of a submarine at Devonport, as all of the missile would have to be removed before the vessel was moved to Plymouth. In addition one or two missiles may occasionally be stored on shore.

¹⁶ The Future of the United Kingdom's Nuclear Deterrent, MoD and FCO, Cm 6994, December 2006.

to be balanced against the negative aspects of SSBN patrols for those involved. It is not unusual for soldiers, sailors and airmen to be deployed away from home for several months. But a unique feature of the submarine service is that there are no communications between submariners and their families during an SSBN patrols. They are not told disturbing news, such as a bereavement, until their patrol has ended.

One of the perks of serving in the surface fleet is that sailors can visit ports overseas. This is true, to a lesser extent, for submariners on SSN. Overseas trips by SSBN are limited to visits to the US in the post-refit work-up period. In a reduced alert posture there would be more scope for port visits by SSBN. This would be particularly true if the nuclear warheads were removed.

In the light of growing speculation about Trident replacement, Admiral Lord Boyce pointed out that if the plans to build the successor submarine were abandoned then the boats should return to port.¹⁷ It would not be reasonable to ask the crews to maintain constant patrols if they knew they could not be sustained. But perhaps even the current widespread scepticism over whether a new Trident force is really what Britain needs is itself undermining the viability of motivating crews and support personnel to sustain continuous patrols ?

Service personnel are susceptible to the value which wider society holds of their work. Keeping Trident on a high state of alert is probably not consistent with most people's view of Britain's defence needs today.

Having sustained patrols for 40 years, ending them is a major psychological hurdle for the submarine service. No one wants to be seen as dropping a baton which has been passed from generation to generation. However after this step has been taken it is likely that the problem would disappear. It is unlikely that after the chain was broken there would be any strong argument about how important it was to restore continuous patrols. Rather it would be looked on as one feature of a past era which had been consigned to history.

13. Conclusion

Ending continuous patrols would provide new opportunities for the submarine service. The work of the fleet could be rebalanced and a higher priority given to the range of tasks carried out by SSN. The lifespan of Vanguard class submarines could be extended, postponing the decision whether to order an expensive replacement. A significant capability could be retained with single-crewed submarines and it would still be possible to restore dual-crewing over time in the highly unlikely event that this was sought. Essential experience could be provided and morale improved by providing more movement between SSN and SSBN during submariners' careers. SSBN could spend more time on exercises with other vessels and less time in isolation on patrol. While there would be no need for operational deployments when SSBN exit Faslane there would be more scope for carrying out multi-vessel exercises. Submarine maintenance regimes would be simplified and the fleet would be better able to respond to any future significant generic reactor defects. In a de-

¹⁷ Defence cuts may put Trident replacement plan on scrapheap; Times 20 June 2009.

mated posture additional training could be required for shore-based support personnel. The Royal Navy would be able to provide alternative ways of maintaining morale in the absence of the current target of maintaining one boat at sea at all times.