Britain's Submarine Nuclear Deterrence - Past, Present and Future

General Introduction

Pronouncements from Her Majesty's Governments in the last decade on Britain's nuclear deterrence[1] have given impressions of undeniable immutability. This is even in light of differences in future possible delivery that has arisen between the Conservative and Liberal Democrat elements of the government of 2010-15. While these can be challenged in many respects, without dealing overtly with the politics, this paper seeks to investigate practical aspects in operating the submarines, with reference to the capabilities of those that have in the past and possibly now pose potential threats to the United Kingdom's security.

Past - Background

Post Second World War, it was not until the Conservatives assumed power in 1951 that atomic weapons were regarded all that keenly in the UK, to deter the Soviet Union. Through diplomacy that government secured aid from the United States of America in pursuing these. In short order, the following year the first British atomic test was carried out. With a Republican government in the US as of 1953, these weapons then took on a new importance in the thinking of the North Atlantic Treaty Organisation (NATO).[2]

Even before the Royal Air Force had their V-bombers operational with atomic bombs in 1958, development of thermo-nuclear devices had already been decided upon three years before. Although regarded as giving 'independence' politically, in many respects the growing reliance on these weapons only tied the UK closer to the USA.[3]

Soviet air defences were already presenting considerable problems and so, an intermediate land-based ballistic missile, *Blue Streak*, was designed. Unfortunately, it was not suitable for British deployment and consequently, was cancelled in 1960. With the aim of keeping Britain's V-bombers operational into the 1970s, the US *Skybolt* air-launched ballistic missile was then going to be bought by the UK. *Skybolt* proved unreliable though and in 1962 this programme was also abandoned.[4]

With UK-US relations not entirely harmonious at this point, talks at the highest political level were held at Nassau in December that same year. The compromise negotiated meant an inherent shift for the UK from air-launched nuclear weapons, to the newly-developed submarine-launched ones.[5]

Western and Soviet development of both 'strategic' ballistic-missile carrying submarines and 'tactical' battlefield nuclear weapons through this decade only complicated matters further. Not only was there a new field of conflict at sea, the concept of 'flexible response' (relating to the shorter-range battlefield weapons) that became NATO doctrine in 1967, proved difficult to plan for safely and responsibly.[6]

Through the previously-mentioned Nassau Agreement of 1962, the UK had the option of buying *Polaris* missiles (minus warheads and associated systems that were to be of British design). With four submarine hulls ordered in 1963, two years later the Labour government

decided on the then up to date A3 version of the missile. The option on a fifth submarine was not taken up though.[7]

The first of these Ships Submersible Ballistic Nuclear (SSBNs), as officially designated, was *Resolution*. She was commissioned in October 1967 and after her first missile firing, officially known as a Demonstration and Shakedown Operation (DASO), seems to have become fully operational in June 1968. Similarly, the fourth boat, *Revenge*, may have begun her first patrol in September 1970.[8] In the interim, Continuous at Sea Deterrence (CASD) had been established.

Even by the time that *Resolution* had become operational a Soviet anti-ballistic missile (ABM) system was regarded as a probable effective defence against NATO missiles and warheads that were targeted on Soviet cities. Consequently, the Americans began developing a successor seaborne ballistic missile, *Poseidon*, with Multiple Independently Targeted Re-entry Vehicles (MIRVs).[9]

With *Polaris* already potentially out of date, *Poseidon* was not taken up by HMG in 1967. After further investigations, in 1973 *Poseidon* was again rejected by the Conservative government, as was the building of a fifth boat that had been considered three years before. Instead, an upgrade to the British warheads and their associated systems was initiated, by Labour, in 1974. Originally known as *Antelope*, in time this became *Chevaline*.[10]

Chevaline proved only to be a partial answer, primarily but not entirely because the Americans were already phasing out their *Polaris* missiles. Apart from this, even with numerous refits the four *Resolution*-class 'bombers' (as SSBNs are unofficially known in the RN) only had a design life of twenty years. *Poseidon* missiles having evolved into *Trident I* (C4), in July 1980 the Conservative government announced its intention of acquiring these missiles (although the decision had actually been taken in December 1979).[11] With negotiations with the United States government continuing, due to a number of considerations, it was not until March 1982 that agreement over the supply of the new *Trident II* (D5) missiles was reached.[12] (In order to potentially limit cost, in 1981 the Ministry of Defence (MoD) considered two options. These were either for four SSBNs with the older C4, or three with the new D5.[13]) Eventually, between 1986 and 1999, the four successor *Vanguard*-class boats were constructed. It was not until late 1994 that the first boat, *Vanguard*, became fully operational though.[14]

In the meantime, the Soviet Union and had visibly begun disintegrating politically and economically as of the mid to late 1980s. Already with the loss of her Eastern European satellites in 1989, there was significant agitation for independence from republics on the Soviet Union's periphery. It was not until after a conservative *coup d'état* was faced down in the autumn of 1991 that the Soviet Union completely collapsed though and formally acknowledged that December. Notwithstanding the formation of the Commonwealth of Independent States, numerous serious national and ethnic conflicts remained unresolved and (for the first time in recent history) Russia invaded Chechnya in 1994. After some stabilisation, by the end of the decade Russia was in dire straits and Vladimir Putin became her President in the spring of 2000.[15]

By 1992 the Russian Navy was much reduced operationally. This was partly through a reduction of foreign deployments, but also due to units taken out of commission. Nevertheless, some new submarines came into service. The general situation soon became

opaque, with disputes over *matériel*, particularly in relation to the Ukrainians and their split of Black Sea Fleet assets: both afloat and ashore. As of 1994 Russian strategic nuclear weapons were no longer to be targeted on the UK and the US. (Intriguingly, the Soviets may have already given up CASD as early as 1986.[16]) The Russians had also continued to destroy such weapons (including SSBNs), as had been negotiated with the US. Of course, this did not mean the end of nuclear testing, or bringing new weapon platforms, such as 'hunter-killer' submarines,[*] into commission. 1995 brought about the beginning of an agreed division of the Black Sea Fleet and also, many previously de-commissioned vessels were physically scrapped. Although substantially scaled down, the Russian Navy remained capable mid decade. And, in spite of their poor overall economic position, in 1998 development of a new submarine-launched ballistic missile (SLBM) began for a new *Borey*-class SSBN. Even so, with new *Dolgoruky*-class SSBNs behind schedule, near the turn of the century the *Delta III*'s in the Pacific were retained in service.[17]

Past - Tactical, Operational and Technical Aspects from the *Polaris* to *Trident* Eras

During the Cold War the acronym MAD was well known, standing for Mutual Assured Destruction. This tactic[**] did not just occur, but developed post Second World War as changing political and martial situations dictated. At least publically, the *raison d'être* of Britain's submarine 'bombers' was as 'second strike' weapons, seeking to deter enemy (Soviet) nuclear 'first strikes' and even conventional war. The reality was rather more complicated. Although normally within the NATO order of battle, with all the ambiguities that this entailed, if necessary, these weapons could be used independently by British governments. Not entirely unexpectedly there were further complexities, such as in possible deployment East of Suez.[18] (Without the declassification and release of various categories of information, trying to make an objective assessment as to how, why and at what stage in a conflict British missiles might have been fired is perplexing.[19])

It has been argued (even occasionally by Cabinet members) that Britain's nuclear deterrent has merely been to keep the United Kingdom at the 'top table' politically.[20] This might be regarded as unduly simplistic when martial aspects are taken into consideration. Whichever has been the reality and of course, this can be regarded as opinion, the ultimate importance of this as a concept is in the seagoing operations.

In order to perform CASD it is essential to have a sufficient number of submarines operational and in doing so, 'friction' should be considered. This was a term apparently coined by the nineteenth century strategist Karl Philipp Gotlieb von Clausewitz for anything and everything that can and does go wrong in war.[21] Therefore, in dealing with force sizes, it can be argued that a meaningful reserve needs to be built into the system. With a small number of boats, the loss or gain of even one has real significance.[22]

[*] Officially designated as Ships Submersible Nuclear (SSNs)

[**] The word tactic is deliberately used in the Clausewitzian sense

Originally, under the Conservatives, there were to be four *Polaris* boats, with the option of another. However, in early 1965, after further consideration, the incoming Labour government did not go for the fifth. Incidentally, there had already been doubt within the previous Conservative Cabinet as to the need for this proposed last boat.[23] This was in spite of coherent arguments made through the Ministry of Defence in a minute for the Prime Minister: Harold Wilson. In this the possibility of some varieties of friction was outlined, as well as politely challenging true 'independence' of the British programme without the requisite number of boats. (See Appendix 1.) Of course, the former might be seen as merely scaremongering by naval officers lobbying for their own professional advantage. In reality, with tight budgets there were also shortages to contend with, such as in personnel, as also mentioned not infrequently elsewhere in this document.[24]

Briefing notes for a Chiefs of Staff (CoS) Committee meeting in June 1980 distinctly show that the opinions of senior naval officers and particularly, the Chief of the Naval Staff and First Sea Lord, Admiral Sir Henry Leach GCB ADC RN had not changed. (See Appendix 2.) Although the Chief of the General Staff, General Sir Edwin Brammall GCB OBE MC ADC, had reservations that were seemingly based on cost, the CoS had, nevertheless, lobbied for five SSBNs, as replacements. Highlighted was the possible failure of the deterrent through 'some mishap' and that four boats involved 'some unnecessary risks'.[25]

On a technical level, it is known that machinery on SSBNs has failed. In one instance, after refit, in 1971 *Resolution* was briefly unable to dive, due to renewed pipe flanges that were unsuitable. In another, in 1973, *Repulse* had a hydroplane defect that made her late for her DASO in the US. There was also an earlier incident that reached the public domain. Embarrassingly, one of *Resolution*'s electrical generators developed a fault during her very first DASO.[26] All these pale into insignificance when compared to an inherent design-fault in British nuclear reactor systems that was first identified in a 'hunter-killer' submarine in 1989. According to one published source, on realising that this similarly affected SSBNs, the CASD was merely 'maintained by a thread'.[27]

Refits were also of long term importance, inasmuch as they could not be kept to their envisioned planned dates. A briefing document in mid 1970 showed that patrol lengths were shortened. (See Appendix 3.) This was to keep the boats operational longer, through less intensive use of their reactors and more time for maintenance and so, smoothing out problems arising from refits. However, poor industrial relations in the dockyard at Rosyth resulted in troublesome union action. Saliently, one de-classified document states that there were to be only two boats, *Renown* and *Revenge*, in the operational cycle between May 1971 and May 1972.[28]

Therefore, there has been at least one period when potentially the only way that the deterrence could have been maintained was by one, or both boats alongside.[29] Whether this has occurred, or not, is not apparent from de-classified documents. Nevertheless, it should be mentioned that the possibility of a fifth-boat arose once again: in 1972. Once again, this was rejected by the Conservative Cabinet in November of that year.[30]

There is also the matter of the reliability of the missiles to consider. A retired naval officer has stated that during the 1980s there was a 'serious problem concerning the reliability of the Polaris warheads'. With the deterrent said to have been in a 'parlous state', this was

kept from senior civil servants and not surprisingly, after it came to light there was the usual 'rancour and recrimination'.[31]

De-classified records, from slightly earlier, show *two* different problems arising in the missiles. The first related to the *Polaris* missile motors. In an early draft of a memo for use by the Defence Secretary, John Nott, in early September 1981, it was stated that the 'first and second stage Polaris motors have been beset by problems over the last decade'. While it had been hoped that they 'might last the whole life of the Polaris force', this was not to be. There was 'clear evidence' of unforeseeable defects potentially threatening to the 'credibility' of the deterrence force. Even although a revised version was more upbeat, there were interesting admissions. According to this there was 'no known remedy' for these faults and 'even if augmented with surplus US stock', these would 'not be sufficiently reliable to guarantee the continued credibility of the deterrent until the 1990s'. Ultimately, the 'increasing unreliability will become widely known since motor failures during test firings are readily apparent to informed observers' and might 'amount to a 100% failure rate'.[32] Mentioning the probability of the Soviets learning of these failures during DASOs in a memo of mid September 1981, the Prime Minister, Margaret Thatcher, was informed that the Defence Secretary had already taken the decision to develop replacement motors.[33]

The second difficulty lay with the *Chevaline* system that had begun flight trials in 1977.[34] One of the September 1981 draft memos pointed out that after 'a successful series of pad-launched firings which demonstrated satisfactorily the capability of the system' there had been 'a set-back' the November before, 'when the electronic circuitry failed to operate satisfactorily during the first trial launches from a submarine'. Further serials were to be conducted during the first quarter of the next year. *Chevaline* was then due to be deployed operationally in August 1982.[35] Also, a press report stated that there had been a 'technical failure' that meant that *Revenge* would 'not be carrying Chevaline warheads' on completion of her refit in early 1982.[36]

These problems were serious, as shown in another press item. According to this, *Chevaline* could not be deployed operationally 'before mid-1983 - on *Resolution*. With the next refits, *Repulse* would follow on, as of 'early 1985'; *Renown* 'by mid 1986'; and *Revenge* not until late 1987 or early 1988.[37]

With open source material it is also possible to show that SSBNs of this era may not *necessarily* have been as invulnerable on patrol as British governments have routinely claimed.[38] In doing so, their operational ranges should be taken into consideration. With the publically stated range of *Polaris* said to have been 2,500 nautical miles and the British Cold War targets being generally if not entirely centred on Moscow,[39] it is a simple matter to use a map and a pair of compasses to determine the possible areas that these could operate within.[40] A little common sea sense will also allow for some areas to be discarded for practical reasons. Submariners, including those of potential or actual enemy nations, will also be able to work out other elements in general terms, such as their maximum operating depths.[41]

In view of the significantly increased range of *Trident* D5 missile systems, of 4,000 plus nautical miles (with their heaviest warheads),[42] it is highly likely that advantage has been taken to modify the *Vanguard*-class boats' patrol areas. Of course, this cannot be regarded as definite, as there are numerous complexities in such operations.[43]

Although research was international, the development and deployment of the Americans' underwater Sound Surveillance System (SOSUS), out of work done in the Second World War, gave NATO immense tactical advantages in tracking submarines from where it was deployed. In the defensive, not only could Soviet diesel-powered submarines* be detected while snorting near the surface, so too could their deeper-running SSBNs. In the offensive, as of the late 1960s the new generations of American and British SSNs were deployed to seek out the Soviet SSBNs.[44] Unfortunately for the west, Soviet espionage, especially by the Walker-Whitworth ring, meant that the Soviets learned that not only were their boats unacceptably noisy, but also that they were being routinely tracked and hunted. Unsurprisingly, they responded both in reducing the SONAR signature of their submarines and also, in further developing their SSNs.[45] Since SOSUS was never infallible, or all encompassing for that matter,[46] intelligent questions might, therefore, be asked as to the assumed invulnerability of past single British SSBNs on patrol.

Past official claims of deep-ocean SSBN 'invulnerability' can also be challenged in other ways. Using Cold War examples, in an American publication there is an admission that with the Soviet deployment of missiles with MIRVs in the 1970s it was possible for the Soviets 'to barrage those US SSBNs at sea whose locations can be roughly determined'. Also, it is known that among assets, the Soviets employed their SSNs offensively against NATO SSBNs in deep-ocean.[47] That being the case, it might be thought that the Soviets had at least some success in their endeavours against NATO SSBNs, especially since the development of the *Akula*-class SSNs and notwithstanding their general defensive moves into deep bastions.[48] There is one known case of a definite contact by a Soviet submarine of an American SSBN at sea in 1967 though. It occurred in the Mediterranean and a collision ensued.[49]

Whether British SSBNs have been invulnerable while clear of UK waters, or not, they still had to transit to and from their patrol areas. Firstly, as previously mentioned, the Royal Navy envisaged the possibility of accident. Apart from natural risks through wind and weather, there has also been the potential for other accidents, such as collisions, to occur. It is, of course, patently obvious that there was much maritime traffic in the Clyde and some vessels that plied these waters have been entirely capable of inadvertently crippling submarines.[50]

Apart from this, as any decent Bathy-Orographical map of the UK should show, the routes between the Clyde bases and the Atlantic proper are in waters of almost entirely less than 50 fathoms (304 feet) until well out: basically to a line between Barra Head and Tory Island.[51] It is, therefore, a perfectly simple matter to imagine how these shallow depths provided potential tactical difficulties for large SSBNs in transit and particularly with knowledge of SSK operations.[52] It might also be of interest to readers to learn that the first time that an enemy submarine operated successfully in the Clyde was in March 1915.[53] That these waters were still seen as suitable for submarine operations post Second World War, was acknowledged by Commodore Derrick George Kent RN in 1969, writing that the '... North Western Approaches and the Clyde Areas are admirable submarining waters; that is why we use them extensively. It follows that they are also suitable waters for enemy submarines incursion in times of tension...'. Subsequently, an anti-submarine helicopter squadron was

* Officially designated as Ships Submersible Konventional (SSKs)

based at Prestwick and as can be seen from de-classified records, many hundreds of hours were flown annually in support of SSBNs.[54] This was for good reason, as can be seen from detection of a Soviet SSK probably in the North Channel, or possibly even in the Clyde in 1966; a *Victor*-class SSN definitely getting into the Clyde in 1972; and a known collision between a US SSBN and a Soviet SSN in the North Channel in 1975.[55] Also, one near collision between a Soviet Auxiliary Gatherer Intelligence (AGI) and a British SSBN, *Repulse*, had already occurred in the North Channel in 1973.[56]

Another aspect that is entirely missing from British governments' public pronouncements has related to submarine-base defence. Originally, as had often been the case with British submarines, the *Polaris* boats were to be supported by a depot-ship. However, as of 1961, Rear-Admiral Arthur Richard Hezlet DSO and Bar DSC RN, as Flag Officer Submarines, lobbied for something very different in the event that the RN was to operate SSBNs and SSNs. In his proposal he stated perfectly logically that it was 'highly improbable' that both depot ships and conventional shore bases would 'survive for long' in full blown nuclear war. What was more, not only would any boats alongside be destroyed, boats at sea would also need to return to harbour 'from time to time to service and replenish'. As smaller countries, naming Norway and Sweden, having already constructed secure underground rock shelter bases for their submarines, in spite of the cost, he advocated that the RN should do the same. Three potential sites were examined and although there were some geological complications, the one at Loch Glencoul (south of Cape Wrath) showed real promise. Of course, this base (that if constructed, as per a diagram, would have resembled something out of the 1960s puppet show 'Stingray') never came into existence. Instead, in 1967 the base at Faslane, in the Gareloch, was commissioned as *Neptune*, along with a separate armament depot at Coulport, in Loch Long that was partly opened in 1968.[57]

Although security at these bases was subsequently tightened, it is worth mentioning that this function was initially carried out merely by MoD policemen. Under strength, sometime between September 1973 and February 1974 sixteen Royal Marines (under the command of a non-commissioned officer) from 45 Commando RM were sent to Faslane as 'an interim measure'. It should be remembered that the Provisional Irish Republican Army had, by this time, begun sporadic attacks on 'soft targets' in the UK. Anyway, in spite of opposition from their senior commanders, an initial decision to have a permanent RM detachment stationed at Faslane was taken in July 1974. Seemingly within a year, this comprised 35 in total, under the command of a lieutenant RM. It should also be pointed out that it is clear from these documents that the *only* threat envisioned was from 'extremists'. No consideration was made for defence against determined conventional military attack: with, or without 'Special Forces'.[58]

From the Past to Present - Changing Conditions and Tactics

Although not immediate, with the rise of Putin came better prospects for Russia's martial establishment. Political and military co-operation with the West appeared to show a new way forward internationally, but for complex reasons, was short-lived. From Russian perspectives events in the Ukraine and Georgia in 2004 were especially worrying. So, as the decade continued although Russia was on the up once again economically, difficulties

increased with both her near neighbours and the West. The years of Dmitry Medvedev's Presidency saw limited shifts in Russian policies, in part due to the worldwide economic crisis as of 2008 and also a war with Georgia. In 2012 relations with the Ukraine worsened significantly once again, as did problems in the Caucasus, the same year as Putin returned as President. 2014 was momentous, with Russia's annexation of the Crimea and substantial military action in Eastern Ukraine - seemingly with the eventual aim of creating yet another 'frozen war'.[59]

During the 1990s the Russian Navy had been reduced by 80 per cent. Nevertheless, in 2000 a new naval doctrine was announced, whereby the navy increased its strategic nuclear rôle with future responsibility for 60 per cent of the total. That said, there were technical setbacks and work on the *Dolgoruky*-class SSBNs was interrupted. By 2003 there was development of a new *Bulava* SLBM. In 2004 there were signs of the Russian Navy returning to international deep ocean operations and from the then lowest point of 13 operational SSBNs between 2002 and 2003, from then the numbers rose very slightly (but can be seen as only in terms of replacement). In 2007, with Putin's second term as President drawing to a close, improvements to Russia's strategic forces included a test flight for the *Bulava* SLBM. By the end of 2011 the past modernisation of all the Russian armed forces as begun in 2008, by President Medvedev, was nearing completion. A test firing of a *Bulava* missile in 2013 proved a failure and this was not for the first time. Most recent information states that Russia probably has 12 SSBNs operational: six of them *Delfin*-class (*Delta IV*s) armed with *Sineva* SLBMs.[60]

It should also be mentioned that the Russians are also strengthening their position in the Arctic. Not surprisingly, this includes the Russian Navy not only returning to their old bases on their northern coasts, but also in further building of facilities and possibly including electronic surveillance stations.[61]

In the international sphere, as a result of the strategic arms limitation and reduction treaties the United States also did away with a large number of SSBNs.[62] Comparable with Russia, the US now fields fourteen *Ohio*-class boats, armed with *Trident* D5.[63] Although the United Kingdom continued with the introduction of its four *Vanguard*-class submarines, there has also been a shift downwards in British capabilities.

Firstly, the stocks of missile warheads have been scaled back. According to Labour's *Strategic Defence Review* (SDR) of 1998, it was decided that the UK required 'a stockpile of less than 200 operationally available warheads'. Continuing, this was said to have been 'a reduction of a third from the maximum of 300 announced by the previous government' and this was 'a reduction of more than 70% in the potential explosive power of the deterrent since the end of the Cold War'.[64] Once again, under Labour, in 2006 another White Paper stated that HM Government had decided to reduce the stockpile of warheads 'operationally available' by 20 per cent: to fewer than 160.[65] The 2010 *Strategic Defence and Security Review* (SDSR), as produced by the present 'Coalition' government, went even further. According to this, the number of 'operational' warheads was to be reduced to 'no more than 120': with a total stockpile cut from approximately 225 to 180 over a decade. Also, the boats would carry fewer missiles at sea: being reduced to eight.[66]

The 1998 SDR stated that Britain would 'have only one submarine on patrol at a time, carrying a reduced load of 48 warheads'. Also, these missiles would 'not be targeted', with 'several days "notice to fire".'[67]

At this stage it is pertinent to explain the basics of the past operational cycle during the Cold War era, with particular reference to the two-crew system. This practice allowed for Britain's small number of boats to fulfil their CASD requirements. Far from there usually being two bombers on patrol for most of the time, when everything is taken into consideration and even with three boats in the operational cycle, not infrequently one boat was completing her patrol while her relief was then beginning her patrol and the third was alongside. And, even with one boat in refit in Rosyth, there were times when one had paid off, prior to going into refit, or alternatively, one recently out of refit was not yet in the operational cycle: most noticeably when on DASO. As for the boats alongside, even with significant support from the squadron and dockyard, getting everything done required considerable efforts by all concerned. (See Appendix 4.)

Returning to the 1998 SDR, an absolutely fundamental change in rôle had also been announced. It opined that the 'credibility of deterrence also depends on retaining an option for a limited strike that would not automatically lead to a full-scale nuclear exchange'. It then stated that *Trident* boats 'must also be capable of performing this "sub-strategic" role'. According to a different source this particular decision had already been taken four years before.[68]

As well as this, in a separately-published supporting essay to this same White Paper it was disclosed that the SSBNs' operational cycle had already been reduced to one on patrol at any one time. At some undisclosed time in the future manning was to be reduced 'from double to single crews' and there was also the intention of the bombers carrying out 'secondary tasks ... including hydrographic data collection, equipment trials and exercises with over vessels'. All this was to be attained 'without compromising their security'.[69]

From a practical point of view, these foregoing statements are fascinating. For a start there are these reductions in ordnance that have been increasingly sanctioned by British governments and regarded as *still* effective in deterrence terms. Assuming that the general numbers of missiles and warheads maintained during the Cold War were the then minimum required, *any* subsequent reduction in capabilities might be seen as intellectually irrational.

The House of Commons Defence Committee took an interest in this apparent change of rôle. Nevertheless, reporting in 2003, frustrations can be identified in that:-

'... On nuclear weapons the Government noted the Committee's call for a clarification of the question of the strategic and sub-strategic role of Trident missile submarines and promised to identify a "suitably early opportunity" to do this. However, it failed to do so other than in a few "dribs and drabs" and in its report on *The MoD's Reporting Cycle 2000-01*, the Committee noted "we consider that the government...needs to address this issue more squarely". The MoD did not respond to this call in its response to that report...'[70]

Further official references to a sub-strategic rôle for Britain's bombers were not forthcoming. Even so, there are explanations to be found elsewhere. In phasing out WE-177, a free-fall tactical nuclear bomb, a replacement had been found in a 'lighter' nuclear warhead

for the *Trident* missile. In effect, this line-up represents tactical usage as part in line with so-called 'flexible response'. Incidentally, it is entirely possible that a variant of this tactic was employed by a *Polaris* submarine as early as 1982, during the Falklands War.[71]

An apparently clear linkage to this tactical use of Britain's SSBNs can be determined later, in Labour's 2006 White Paper on the nuclear deterrent. Within a section on 'enduring principles', it professed that HMG had 'deliberately' maintained 'ambiguity' in relation as to when it 'might consider the use' of these so-called assets. Saliently, it was stated that HMG would 'not rule in our out the first use of nuclear weapons'.[72]

This aspect of the 2006 White Paper resulted in public disquiet. Consequently, a couple of pronouncements were made early in 2007 damping this down. The wordings of these are intriguing, as it was stated that HMG intended ceasing 'using the term sub-strategic', rather than the tactic itself.[73] Nevertheless, it is probable that the sub-strategic rôle has indeed been discontinued.[74] All the same within the present 'Coalition' government's Defence Review of 2010 is reference to rules of engagement. In this an 'assurance' was given to 'non-nuclear weapon states' that had signed the Treaty on the Non Proliferation of Nuclear Weapons (NPT) that the UK will not use nuclear weapons against them. Of course, this is not entirely the case, as 'universal adherence and compliance with the NPT' is required. Anyway, HMG reserves the right to review this, if these states develop 'other weapons of mass destruction, for example chemical and biological'.[75]

Present - State of and potential threat to the United Kingdom's Deterrent

In spite of sanguine projections relating to longer-lasting nuclear reactors for the *Vanguard*-class boats, as with the older *Resolution*-class, it is publically known that there are now only a maximum of three in the operational cycle at any one time.[76] (It has also transpired that there have been problems with *Vanguard*'s reactor.[77]) This, therefore, means that instead of the anticipated 'two boats on patrol for about 80% of the time', even with two crews per bomber, the situation would be similar to that of the days of the old *Polaris* boats.

Leaving aside the pronouncements in the 1998 SDR and its annexes that the *Vanguard*-class boats were to be employed more as general purpose units, if CASD was still to be strictly maintained questions can be asked as to how even this could be attained with single crews for the SSBNs. Of course, this might not be regarded of particular importance in political circles if there were no threats to Britain's security.

Even with nuclear arms reduction and other cooperation between Russia and NATO, as already briefly outlined, this had never stopped the Russians from engaging in all sorts of interference in numerous border disputes with their near neighbours (some of which also adversely affected western energy supplies). NATO's responses have only complicated matters, being contradictory. Russia's 2008 invasion of Georgia resulted in tensions, but it was not until Russia's 2014 annexation of the Crimea that some in the West began to wake up to real problems.[78]

The situation in eastern Ukraine has become exceedingly complex, not helped by Russian *Maskirovka*.[79] Understandably, other one-time Soviet states with Russian minority populations are now showing signs of deep anxiety.[80]

Apart from covertly in Eastern Ukraine, the Russian armed forces are also metaphorically flexing their muscles variously. Perhaps most worryingly, it is thought that through Russia's new military doctrine, among ominous changes, the threshold on the use on nuclear weapons has been lowered. Possibly linked to this, at a tactical level on land Russian mobile ballistic missile launchers have apparently recently been put on to a higher state of patrolling.[81] There has also been the intention of returning to CASD by Russian SSBNs since 2012, although there are some doubts as to whether this has really yet been attained.[82]

If reports in the media are correct, there has also been an upsurge in Russian naval activities in western waters,[83] including submarine operations off Scotland's west coast. One incident occurred in November 2014 when there was an apparent periscope sighting. American, Canadian and French Maritime Patrol Aircraft (MPA) were deployed to prosecute this. There was another incident in January 2015. In this case, two US aircraft were also used and it was speculated that Russian submarines had been trying to intercept British SSBNs.[84]

Although MoD expressed no concern publically, this must have caused private embarrassment. Britain's lack of MPA capability is due entirely to a decision by this present government in scrapping the Nimrod MR4A Maritime Patrol Aircraft programme.[85] Had SOSUS been active, these intruders may well have been tracked on their way to and from Scottish waters. However, it has been said that this system has been reduced to a 'care and maintenance basis'.[86] Furthermore, SSKs might be regarded in some quarters as old and smelly, but they can still be extremely quiet and highly potent fighting machines - particularly with modern auxiliary Air Independent Propulsion systems. With all this in mind and a general shortage of other force protection capabilities, it might be assessed that British SSBNs are potentially vulnerable to Russian submarine attacks.[87]

Incidentally, it should be noted that operations such as this are not all one sided. In August 2014 there were claims of the supposed ejection from the Barents Sea of an American SSN, by Russian Anti-Submarine Warfare (ASW) aircraft. This cannot be regarded as an entirely isolated incident either.[88] It has also been said that in this era the Americans now patrol under the Arctic ice more often than do the Russians and there is evidence that British SSNs continue in their share of these missions.[89]

The Future

The future continuation of the UK's deterrence lay with the Labour government in 2006 and Parliament the following year.[90] Accordingly, technical work on the hulls of a 'successor' class of submarines is said to be in hand.

A situation report on this was published in 2011. Hardly surprisingly, some 'technologies' that are said to have been 'proven' on the *Astute*-class SSNs are to be incorporated, although new developments in areas such as 'communications, tactical weapon systems, batteries and structural materials' may mean divergence from this. However, the new SSBNs are to receive a new reactor system, PW3, planned to have a far longer life than their predecessors. Also, in 2007 it was agreed that there would be US-UK cooperation in the development of a Common Missile Compartment (CMC). Nevertheless, it is interesting to note that the US SSBNs are to have twelve missile CMCs, while British ones will have eight only. Therefore, these cannot be entirely standardised. Also, for budgetary reasons, there are

no intentions to begin development of a replacement warhead for the British *Trident* D5 missiles in the near future.[91]

Not all that overt in this document, internal disagreements within the government can be discerned, in that the decision as to the number of SSBNs to be built and operated had been put off until 2016. In the foreword this is referred to in the sense of whether three, or four boats, would be required to maintain CASD. Later, in the section on cost estimates, an assessment for four was stated though.[92]

At a practical level, it is now known that problems have arisen in the development of future production facilities of enriched uranium for fuel and warheads.[93] More optimistically for proponents, further funding for the design of the 'Successor' SSBNs was announced in March 2015.[94]

Dissenting from the majority Conservative view on how deterrence might be attained, the Liberal Democrats had an investigation carried out by the Cabinet Office and published in 2013, as the *Trident Alternatives Review* (TAR). Even within this was a defence of CASD with a four submarine squadron and so, might be regarded as the mainstream stance of the decision-makers.[95]

The TAR concluded that there were 'alternatives to Trident that would enable the UK to be capable of inflicting significant damage such that most potential adversaries around the world would be deterred'. It further admitted that there were 'alternative non-continuous postures (akin to how we operate conventional military assets) that could be adopted, including by SSBNs'. However, these 'postures' of 'reduced readiness' could only be maintained when 'the threat of a no-notice pre-emptive attack' was thought to be 'low' and ultimately, there were numerous risks in both NCASD and non-*Trident* systems.[96]

The Liberal Democrats subsequently produced a policy paper on defence later in 2013 that in part dealt with nuclear deterrence. Assuming a 'Contingency Posture', according to this, a Liberal Democrat government would begin with the ending of CASD and by implication, the reduction in number of *Trident*-armed boats. Secondly, while mounting NCASD the present boats would be re-fitted to also handle other weapons and systems - primarily US *Tomahawk* missiles (with conventional warheads). Normally, the boats would be 'unarmed' and this would be stated publically, but, 'during limited periods' of extreme political stress, they would receive missiles. In the medium term, a fewer but unstated number of 'successor' submarines (along with their crews) would replace the *Vanguard*-class boats. In the long term, 'multi-purpose' submarines would be designed, with a 'capability to re-role from conventional to nuclear missions within a specified timeframe'. The submarine crews would be required to 'exercise the submarine capability to maintain relevant skills, including weapons handling and nuclear command and control' and also to '(p)eriodically practise redeployment of an armed submarine within a specified timeframe'.[97]

In periods of non-tension it would be reasonable to regard three SSBNs as an absolute minimum to operate a policy of NCASD. This would mean that after they began going into refit there would be one boat at sea, or ready to sail and a second in routine maintenance or training. In the case of one of these suffering major damage, or even accidental loss, there would only be one single boat left. If CASD ever became necessary and there were only three

boats maximum (with one these in refit), even without serious friction, it can be argued that that it would be highly problematical to attain CASD in the long term.

Maintaining the current level of four SSBNs (in total) but reducing their sea time in NCASD also presents practical problems. Unless absolutely excellent new docking facilities were to be constructed, keeping boats out of the water and under cover, their hulls would still continue to deteriorate alongside, increasingly requiring time in dry dock.[98] Apart from this, for machinery to remain reliable, even without design faults, it needs both to be run and maintained.[99] The only realistic way of dealing with these is to send the boats to sea and then maintain them properly while in harbour. This begs questions as to the potential for meaningful cost-cutting in *matériel* and maintenance.

In the case of NCASD if there were four SSBNs (with three generally in the operational cycle at any one time), conceivably the two-crew system could be dropped, as envisioned in the 1998 SDR. Even so, the fully-trained spare-crew contingency ashore would then have to be increased significantly, to ensure that the boats could be deployed in CASD if required. In this eventuality double crews would be essential once again. (Apparently, there is a hybrid between single and double crews currently in operation.[100])

Continuing on personnel matters, all sorts of questions can be raised. These range from professional and pre-qualification training,[101] through to balanced periods of sea time (and hence expertise and experience), to retention rates. This is mentioned with a presently known not insignificant shortage of some submariner technical ratings.[102]

Before moving on to tactical matters, it should be mentioned that the refitting of SSBNs as 'dual-capable' submarines (that in effect would be guided-missile boats[*]) would be fraught with potential difficulties. As with many other types of machines, warships are designed with specific uses. Submarines are no different from surface ships in this respect.[103]

If the deployment of SSBNs was not as straightforward during the Cold War as has often been maintained, international situations that have arisen since make this even more complex. The dual arrangement of being under NATO and British governmental control remains, with all the political and martial dilemmas that this has and might still produce.[104] The 'reintroduction' of a 'sub-strategic' capability in SSBNs or SSGNs would complicate matters exponentially though.

As has already been mentioned, under the 2010 SDSR, a circumscribed 'assurance' has been given to NPT states. No such declaration was accorded to those in other countries having, or suspected of having nuclear weapons though. Instead, it would seem that they fall under the general policy in that the government of the UK would 'only consider' using their nuclear weapons 'in extreme circumstances of self defence' and it remains 'deliberately ambiguous about precisely when, how and at what scale' it 'would contemplate their use.'[105]

It is not illogical to think that the present government may also adhere to an earlier policy, as espoused by Labour, in 2006. Relating to 'emerging nuclear states' and possible terrorist activity it was said that 'any' state that HMG 'can hold responsible for assisting a nuclear attack' on its 'vital interests can expect that this would lead to a proportionate response'.[106] It remains to be seen what that 'proportionate response' would be.

[*] Officially designated as Ships Submersible Guided-Missile Nuclear

It is, therefore, entirely possible that situations might arise where SSBN launched 'sub-strategic' weapons could and would be used against 'Third World' nations. Taking this process to its logical conclusion, not only might reduced-charge nuclear weapons be delivered in this way, so too might conventional high-explosive.[107]

Such situations, even if not actually acted on to the point of nuking countries deemed to have acted unacceptably, could well create tactical difficulties. The substantial ranges that are said to be obtainable from *Trident* D5 missiles notwithstanding, with the *Vanguard*-class boats it should be possible to position the duty bomber where its command could deal with one transgressor, say in the Middle East, with 'sub-strategic' missiles, while still able to carry others with 'strategic' warheads for deterrence against a more powerful enemy: Russia, or even China. Of course, even with four boats and CASD restored, with only eight tubes for the 'Successor' class, this could prove rather problematical. Any political-military situation more complicated than this could defeat the UK's deterrence.[108]

As already articulated, a more powerful enemy has indeed emerged, or to be more precise, re-emerged - a resurgent Imperial Russia. Not identical with the Soviet Union or Tsarist Russia for that matter, there are, nevertheless, many similarities in both. Therefore, based on past experience and notwithstanding the generally good standard of work produced by the Commons Defence Committee[109] it may be prudent for urgent reappraisals of Britain's defence in general and nuclear deterrence in particular to be undertaken. As a final thought, it would be highly ironic if, apart from reasons of pride, the Russians had reinstated their CASD in order to provide them with an ultimate 'insurance policy' against NATO, so that they could operate against their weaker neighbours militarily unimpeded.[110]

Appendix 1

Excerpt of a Secret, undated, draft MoD minute to the Prime Minister, entitled 'Size of the U.K. POLARIS Force'. See TNA: PRO ADM 1/28842

'... The effective difference between five and four submarines is as follows:-

> (a) With five submarines we should be able to keep two submarines on station throughout the year with a third available at four days' notice or less and for about a month either on station or at immediate standby; thus, even if one submarine, owing to a breakdown, accident, or other cause, ceases to be operational, there would still be one submarine on station at all times to provide a valid deterrent.
>
> (b) With four submarines, we could keep one on station at all times, except in the case of breakdown or accident, and either a second on station for 36 weeks of the year, with a third always at four days' notice for 36 weeks or less, or a second submarine at eight hours' notice for 36 weeks with the third at four days' notice or less throughout the year.

It is difficult to assess the chances of a submarine on patrol becoming non-operational, but, however remote the chance of detection by an enemy, we cannot claim complete invulnerability. Moreover, we cannot absolutely discount the possibility of a collision when entering or leaving harbour, or of some other accident.

4. It is thus arguable that, unless we order the fifth submarine, we are not providing a credible deterrent, if by that we mean an independent national deterrent as opposed to a contribution to the Western deterrent as a whole. On the other hand, I understand that, given any reasonable period of warning, we ought to be able to have at least one boat at sea.

5. The difficulty about providing a fifth boat is, of course, that of finance. The capital cost would be approximately £44 m. over eight years from 1964/5 to 1971/2; increased running costs would level off at about £6 m. a year. No provision for this expenditure has been made in our forward costings which are already, as you know, under severe pressure...

6. The Chiefs of Staff advise me that, in view of the pressures on the Defence Budget, they would be most reluctant, on overall military grounds, to accept this additional burden on the available resources of money. They would be unwilling to accept any reductions elsewhere in the programme. There is, moreover, the point that the addition of a fifth boat could not fail to exacerbate the manpower problem among "shortage categories" in the Royal Navy...'

N.B. There are numerous versions of this minute, with occasional minor differences. The one quoted follows a Secret MoD memo, signed by Harry Godfrey and addressed to Ian S. McDonald, of the Admiralty, dated 13th December 1963

Appendix 2

Excerpt of documentation for a Chiefs of Staff Committee Tuesday 10th June 80 at 1445. See TNA: PRO DEFE 25/325 - Documents marked '1' The case for five SSBNs - Speaking Note pp.2-3

' Over the last eleven months we have discussed several times the number of SSBNs required for a fully effective strategic deterrent system. In August, my predecessor advised the Secretary of State that a successor force consisting of five SSBNs, each with 16 Trident MIRVed missiles, was the one best fitted to the UK's needs. In November we re-affirmed this view and the Secretary of State accepted our advice.

You will also recall our last discussion in March of the paper prepared by the DPS on the case for five boats. This was produced because I believe that Ministers may not be fully aware of all the factors pointing to the need for five SSBNs. They include offensive capability, invulnerability, insurance against accident and industrial disruption; these aspects are all fully covered in the paper and need not be rehearsed again here. Yet these arguments may not have their proper impact unless we bring them to the attention of Ministers during the period when the political decision-taking process is coming to a head - as it will do in the next few weeks.

This is clearly the time to remind Secretary of State of our view that five boats is the best solution. There are three main reasons for doing this now: first, because during the recent DPWP work some illustrative costing has been done on the basis of a four boat force. There is some danger that unless we re-iterate the five boat case, we shall slide imperceptibly into a situation where the four boat solution becomes a firm policy assumption by default. Secondly, there is the important consideration of persuading Ministers to agree in principle to a five boat force. The final decision on laying down this boat need not be taken for some time yet, and it would be a simple matter to move back to a four boat force if circumstances change. The reverse does not apply; I firmly believe that any attempt to re-open the subject again in say 1983, in an effort to change Ministers minds in favour of a fifth boat, would be doomed to failure. Thirdly, and most important, if for financial reasons Ministers ultimately decide to settle for a four boat force, the Chiefs of Staff should be firmly on record that in their considered military judgement a five boat successor system ought to have been acquired. If this is not done, and some mishap or other subsequently cripples the continuity, or effectiveness of our deterrent - perhaps many years in the future - then the Chiefs of Staff would be rightly held partially responsible, if they had tacitly agreed that four boats was enough. We should say now that four boats involves some unnecessary risks...'

Appendix 3

Excerpt of Top Secret Strategic and Political Nuclear Policy Brief No. 17, entitled 'Future of the Polaris Force', c.7th July 1970. See TNA: PRO DEFE 13/1050

'... 3. To maintain deterrence, at least one POLARIS submarine is on patrol at all times. Since allowance must be made for essential maintenance between patrols, at least two submarines must be operational at any time (that is not undergoing refit, trials or work-up). When two or more submarines are operational, a second submarine can be kept on patrol for some of the time.

4. Each operational submarine works to an 84-day cycle, during which on average 56 days have hitherto been spent on patrol and 28 days at Faslane, while maintenance is carried out and the crews are changed. In April it was decided to reduce the average time spent on patrol in each cycle from 56 to 49 days (increasing the average inter-patrol period from 28 to 35 days) and to introduce extended inter-patrol maintenance periods for RENOWN and REVENGE in the period before REPULSE enters refit in 1971. The purpose of this less intensive use of the submarines is to conserve their nuclear cores and so create the option of keeping them operational for longer than our plans have hitherto allowed in order to cover any delays in the planned completion of the first refits of RESOLUTION and REPULSE...'.

Appendix Four

On a *Polaris* boat returning from patrol there was a short turnover period between the crews: from say from port to starboard. After this that incidentally, included de-storing of food, weapons, ammunition and such like, the port crew would have a very short leave: normally a long weekend. On completion, the port crew would return to the boat alongside and aid the starboard crew in essential maintenance of hull, casing, machinery and elsewhere internally. (It was also not unusual for there to be additional work parties from the squadron's spare crew.) Storing would also take place, normally nearer the end of this phase. The starboard crew would subsequently take the boat to sea, but only for independent exercises. These would comprise everything from trim-dives to weapon certification (with many other varieties in between). After another shorter period alongside, possibly dealing with mechanical problems as well as further storing and painting, the starboard crew would then take the boat to sea, this time on patrol. Admittedly, not all of the port crew would have been required to be on the boat during the times alongside, but generally it was not until the starboard crew had gone on patrol that the port crew would get their leave proper.

Even with essentially two crews on these boats while alongside, working days were still long and under tight time constraints, pressured. Also, for those working on the hull and casing, in cold and wet weather, life was routinely utterly miserable.

During this 'off-crew' time after the boat had gone on patrol, everything else also had to be fitted in. It should be mentioned that some officers and ratings were required to maintain administration (for both crews) and provide specialist support ashore at *Neptune*. Professional courses were attended, as well as shorter promotional courses. It was also not unknown for individuals to be 'loaned' elsewhere, although contrary to popular belief, these were not for holidays. For instance, those that went out to Hong Kong might well find themselves on the ex-minesweepers engaged nightly in anti-immigration patrols. So, these temporary drafts could be valuable in gaining professional experience and even a wider understanding of the world. Depending on individuals' characters, these might even be morale boosting.

N.B. Even although the routines on *Polaris* boats have occasionally been written about, such as in Jonathan Crane: *Submarine* (London: British Broadcasting Corporation, 1984) pp.177-204, this has been written from personal experience

[1] HM Government: *The Future of the United Kingdom's Nuclear Deterrent* 2006; HMG: *A strong Britain in an Age of Uncertainty: The National Security Strategy* 2010; HMG: *Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review* 2010; HMG: *Submarine Initial Gate Parliamentary Report* 2011; and HMG: *Trident Alternatives Review* 2013

[2] Lawrence Freedman: *Britain and Nuclear Weapons* (London & Basingstoke: The Macmillan Press Ltd. for the Royal Institute of International Affairs, 1980) pp.1-4
N.B These and subsequent events are covered in a very different way in another work. See Peter Hennessy: *Cabinets and the Bomb* (Oxford: OUP for the British Academy, 2007)

[3] Freedman: *Britain and Nuclear Weapons* pp.4-7
N.B. Although it was not until 1958 that the V-bombers were operational, other aircraft had already been used for two years. For types of bombs see John Baylis and Kristan Stoddart: *The British Nuclear Experience: The Role of Beliefs, Culture, and Identity* (Oxford University Press, 2015) p.219

[4] Freedman: *Britain and Nuclear Weapons* p.8

[5] Ibid. pp.15-17

[6] Ibid. pp.20-21

[7] Ibid. pp.9-17, pp.32-33 & pp.35-36; and 'Two Polaris Orders for Merseyside' in *The Times* 9th May 1963 p.12

[8] Robert Gardiner: *Conway's All the World's Fighting Ships 1947-1995* (London: Conway Maritime Press, 1995) p.531; Freedman: *Britain and Nuclear Weapons* p.34; Basil Gingell: 'New Era in Deterrence' in *The Times* 3rd October 1967 p.3; The National Archives: Public Record Office DEFE 69/127 - *Resolution* - Patrol Report 1st June to 31st August 1968 (still held by MoD); ADM 173/29761 – *Revenge* - Control Room Log 10th February to 4th March 1970; and DEFE
69/147 - *Revenge* - Patrol Report 1st September to 30th November 1970 (also still held by MoD)

[9] Freedman: *Britain and Nuclear Weapons* pp.36-37

[10] Ibid. pp.37-55
N.B. As regards the *Chevaline* project, even although there is now a considerable number of files in TNA catalogues, comparatively little is within the public domain. Nevertheless, some detailed analysis is available. For example, see John Baylis and Kristan Stoddart: 'Britain and the Chevaline Project: The Hidden Nuclear Programme, 1967-82' in *The Journal of Strategic Studies* (London: Frank Cass, December 2003) volume 26 number 4 pp.124-155. Also, Contrary to expectations this upgrade cost a fortune. £1,000 million was mentioned as the cost both in briefing documents and press pieces. For example, see TNA: PRO FCO 46/2287 - Confidential document, March 1980, marked as '40'; and Peter Hennessy: '£1,000m deterrent fails to get off ground' in *The Times* 30th June 1981 p.3

[11] Freedman: *Britain and Nuclear Weapons* pp.55-57, pp.58-63, pp.68-74, p.75, pp.76-79, p.95 & p.100; TNA: PRO FCO 46/2288 - numerous papers relating to the July 1980 events; CAB 130/1222; CAB 130/1109 - Minutes of Nuclear Defence Committee 5th December 1979; and CAB 130/1160 – Minutes of Nuclear Defence Committee 24th November 1981

[12] TNA: PRO FCO 46/2288; FCO 46/2289; FCO 46/2290; FCO 46/2291 (one relevant telegram only); FCO 46/2750; FCO 46/2751; FCO 46/2752; FCO 46/2753; CAB 130/1109; and http://www.reagan.utexas.edu/archives/speeches/1982/31182b.htm
N.B. There are also numerous references to UK-US interaction on this subject in Cabinet Nuclear Defence Policy minutes within class TNA: PRO CAB 130; and there are other inputs on this era to be found in Hennessy: *Cabinets and the Bomb* pp.323-326; and Tanya Ogilvie-White: *On Nuclear Deterrence: The Correspondence of Sir Michael Quinlan* (London: Routledge for IISS, 2011) pp.220-231

[13] TNA: PRO CAB 130/1160 - Cabinet Nuclear Defence Policy - United Kingdom Strategic Deterrent Memorandum by the Secretary of State for Defence - MISC 7(81) 1 - 17th November 1981 and annexes

[14] Commodore Stephen Saunders RN: *IHS Jane's Fighting Ships 2014-15* (Coulsdon, Surrey: IHS Jane's, 2014) p.896; Gardiner: *Conway's All the World's Fighting Ships 1947-1995* p.553; and Michael Evans: '1bn missile submarine trapped in Scottish loch by activists using inflatable rafts' in *The Times* 26th November 1994 p.5

[15] The International Institute for Strategic Studies: *Strategic Survey 1989-1990* (London: Brassey's, 1990) pp.15-27; IISS: *Strategic Survey 1990-1991* (London: Brassey's, 1991) pp.135-161; IISS: *Strategic Survey 1991-1992* (London: Brassey's, 1992) pp.15-28; IISS: *Strategic Survey 1992-1993* (London: Brassey's, 1993)

pp.66-83; IISS: *Strategic Survey 1993-1994* (Oxford, Oxford University Press, 1994) pp.81-98; IISS: *Strategic Survey 1994-1995* (Oxford: OUP, 1995) pp.76-93; IISS: *Strategic Survey 1995-1996* (Oxford: OUP, 1996) pp.114-125; IISS: *Strategic Survey 1998-1999* (Oxford: OUP, 1999) pp.128-139; and IISS: *Strategic Survey 1999-2000* (Oxford: OUP, 2000) pp.119-133; and for general background on the initial rise of Putin Edward Lucas: *The New Cold War: How the Kremlin Menaces both Russia and the West* (London: Bloomsbury Publishing Ltd., 2008) pp.25-46; and Ben Judah: *Fragile Empire: How Russia fell in an out of love with Vladimir Putin* (London: Yale University Press, 2013) pp.7-34

[16] *Russian Defense Policy* at https://russiandefpolicy.wordpress.com/2012/02/05/ssbn-patrols/
N.B. Due to the Soviet bastion defence tactics, it is entirely possible that this was not appreciated by NATO

[17] Gardiner: *Conway's All the World's Fighting Ships 1947-1995* pp.337-338; IISS: *The Military Balance 1989-1990* (London: Brassey's, 1990) pp.28-29, p.31, p.33 & pp.35-37; IISS: *The Military Balance 1990-1991* (London: Brassey's, 1991) pp.28-30, pp.31-32, p.34 & pp.36-38; IISS: *The Military Balance 1992-1993* (London: Brassey's, 1993) pp.89-90 & pp.91-97; IISS: *The Military Balance 1993-1994* (London: Brassey's, 1994) pp.93-96, pp.97-98, p.99 & pp.100-104; IISS: *The Military Balance 1994-1995* (London: Brassey's, 1995) pp.107-108, p.110, pp.111-112 & pp.114-17; IISS: *The Military Balance 1995-1996* (Oxford: OUP, 1996) pp.107-108, pp.113-114 & pp.115-118; IISS: *The Military Balance 1996-1997* (Oxford: OUP, 1997) p.107, p.113 & pp.116-118; IISS: *The Military Balance 1997-1998* (Oxford: OUP, 1998) pp.101-104, p.108 & pp.110-113; IISS: *The Military Balance 1998-1999* (Oxford: OUP, 1999) pp.101-102, p.108 & pp.109-112; and IISS: *The Military Balance 1999-2000* (Oxford: OUP, 2000) p.104, pp.106-107, p.111, p.112 & pp.113-115
N.B. For a general description of these arms reductions, see endnote 62

[18] Generally, see Freedman: *Britain and Nuclear Weapons*; and Robert S. McNamara: *Blundering into Disaster: Surviving the First Century of the Nuclear Age* (New York: Pantheon Books, 1986). In relation to targeting, originally the airborne V-bombers were 'formally assigned to NATO in 1963' and controlled by the Strategic Air Command, Omaha. See, Freedman: *Britain and Nuclear Weapons* pp.25-26. As of October 1967 *Polaris* submarines and missiles have been under normal command by British naval authorities, with targeting and other aspects assigned to Supreme Allied Commander Europe. See TNA: PRO DEFE 13/1050 - Strategic and Political Policy Brief No. 17 - Future of the Polaris Force pp.2-3

[19] Although it may be possible to speculate from disparate snippets in already released and open source material, there are records that while in TNA's catalogue, remain with their departments. In particular there are the *Polaris* firing orders CAB 196/80 and CAB 196/119. Others, such as DEFE 69/450 and DEFE 69/451 may well also give pertinent information

[20] Example, by Sir Alexander Douglas-Home, see Freedman: *Britain and Nuclear Weapons* p.88

[21] Carl von Clausewitz: *On War* (London: Penguin Books, 1982) pp.164-167

[22] Even if highly sanguine, this was acknowledged in a MoD briefing during the deliberations on the replacement of the *Polaris* boats. See TNA: PRO CAB 130/1160 - MISC 7(81) 1 p.10

[23] Freedman: *Britain and Nuclear Weapons* pp.31-33

[24] TNA: PRO ADM 1/28842 - Secret, undated, draft MoD minute to the Prime Minister, entitled 'Size of the U.K. POLARIS Force' produced in December 1963
N.B. The next year there were similar pleas from the RN in relation to the then possible Atlantic Nuclear Force. See TNA: PRO DEFE 13/350 - Top Secret MoD memo, entitled 'ATLANTIC NUCLEAR FORCE: THE SIZE OF THE BRITISH POLARIS FORCE, c.19th November 1964

[25] TNA: PRO DEFE 25/325 - Chiefs of Staff Committee Tuesday 10th June 80 at 1445' - Documents marked '1'

[26] TNA: PRO DEFE 13/1050 - Secret memo from the office of the Controller of the Navy, 1st October 1971, entitled 'HMS RESOLUTION - DIVING RESTRICTION' p.41A; and Confidential memo from the Assistant Controller of the Navy, 5th January 1973, entitled 'HMS REPULSE - CHANGE IN DASO PROGRAMME'; and TNA: PRO DEFE 13/547 - 'Power Fault in Submarine' in *The Times* 9th January 1968

[27] Richard Conley & Dan Woodman: *Cold War Command: The Dramatic Story of a Nuclear Submariner* (London: Seaforth Publishing, 2014) pp.232-233

[28] TNA: PRO DEFE 13/1050 - Top Secret Strategic and Political Nuclear Policy Brief No. 17, entitled 'Future of the Polaris Force', c.7th July 1970; and DEFE 13/1050 - Top Secret UK Eyes Only memo from the

Parliamentary Under-Secretary of State for Defence for the Royal Navy, 7th May 1971, entitled 'SSBNS - EXTENDED NOTICE FOR SEA' and voluminous correspondence on the industrial disputes

[29] Freedman: *Britain and Nuclear Weapons* p.35; and for some technical detail on the development of the launcher subsystem, see Graham Spinardi: *From Polaris to Trident: the Development of the US Fleet Ballistic Missile Technology* (Cambridge: CUP, 1994) pp.39-42

[30] TNA: PRO DEFE 24/512; and Freedman: *Britain and Nuclear Weapons* p.44

[31] Conley & Woodman: *Cold War Command* pp.254-255

[32] TNA: PRO FCO 46/2751 – Documents marked '66' – Draft p.7; and '67' p.2

[33] TNA: PRO FCO 46/2753 – Documents marked '84' - Memo p.1

[34] TNA: PRO FCO 46/2287 – Letter B.M. Norbury to C.A. Whitmore 14th February 1980 marked as '17'

[35] TNA: PRO FCO 46/2751 – Documents marked '66' – Draft pp.6-7; and '67' p.2

[36] Peter Hennessy: '£1,000m nuclear deterrent suffers setback in trials' in *The Times* 30th June 1981 p.1

[37] Peter Hennessy: 'Short life for the Navy's £1,000m stand-in deterrent' in *The Times* 6th July 1981 p.3

[38] The wording in published governmental pronouncements has been intriguing, inasmuch as it has often strongly *inferred* invulnerability, such as within the justificatory published document entitled *The Future United Kingdom Strategic Nuclear Deterrent Force* 1980 p.6, as drafted by Michael Quinlan. See copy TNA: PRO FCO 46/2288 and Ogilvie-White: *On Nuclear Deterrence* p.327. However, in one this was stated as absolute fact. See HMG: *The Future of the United Kingdom's Nuclear Deterrent* 2006 p.26 & p.27
N.B. Complete invulnerability may not have been entirely accepted by others. For instance, before a Commons Defence Committee, Rear-Admiral John Scott Grove RN (as 'Chief Polaris Executive') stated 'that although it was not possible to be 100 per cent sure, "on our evidence we have very good reason to think we have not been detected"'. See TNA: PRO FCO 46/2734 - copy of *House of Commons Defence Committee: Strategic Nuclear Weapons Policy. Minutes of evidence*, 29th October 1980 (HMSO) pp.80-8. It should be pointed out that Rear-Admiral Grove was an engineering officer and so, hardly likely to have seen detailed operational data

[39] Freedman: *Britain and Nuclear Weapons* p.36, pp.37-38, pp.39-40, pp.45-47, p.54, pp.60-61 & p.77; Kristan Stoddart: 'Maintaining the 'Moscow Criterion': British Strategic Nuclear Targeting 1974-1979' in the *Journal of Strategic Studies* volume 31 number 6 pp.897-924; Ogilvie-White: *On Nuclear Deterrence* pp.221-223; and Peter Hennessy: '£1,000m deterrent fails to get off ground' in *The Times* 30th June 1981 p.3
N.B. Within a booklet for those joining Polaris boats there is a full-colour diagram showing the path of a missile from launch to impact. See National Maritime Museum: *Polaris: An introduction to the British Polaris Force issued by authority of The Chief Polaris Executive and Flag Officer Submarines*

[40] Actually there is no necessity to conduct this exercise, as such a map of specimens relating partly to deployments 'East of Suez' has already been declassified. See TNA: PRO DEFE 13/547 - Annexure A to Appendix 1 to Annex A to COS 82/67

[41] One de-classified document actually mentions a predicted maximum operating depth for *Polaris* boats on patrol. Those that have the appropriate expertise would be able to work out how accurate this may, or may not, have been in reality. TNA: PRO DEFE 13/295 Secret Guard - Communications with Polaris Submarines (Note by the Admiralty) E33. Further information in this and another file, when taken together, would also allow for their speeds on patrol to be assessed in general terms and so on. See DEFE 67/98 - Operational Evaluation Note - Detectability of Submarine Trailing Wire Aerial
N.B. I would not have quoted these had I not learned that bombers' speeds and general operating depths have now been made public. See Iain Ballantyne: *Hunter Killers: The Dramatic Untold Story of the Royal Navy's Most Secret Service* (London: Orion Books Ltd., 2013) p.203 & p.204; and Conley & Woodman: *Cold War Command* p.205

[42] A published maximum range of the older C4 missile was 4,000 nm. See Freedman: *Britain and Nuclear Weapons* p.76-77. As for the more modern D5 missile, sources vary considerably, but the seemingly most accurate gives 4,230 nm for fully-loaded missiles. See http://en.wikipedia.org/wiki/UGM-133_Trident_II

[43] Allusions are made to this in Ballantyne: *Hunter Killers* p.319 & p.390

[44] For instance, there was the successful tracking of a new Soviet *Yankee*-class SSBN by a US SSN, *Lapon*, in September 1969. See Sherry Sontag and Christopher Drew: *Blind Man's Buff: The Untold Story of Cold*

War Submarine Espionage (London: Arrow Books, 1999) pp.129-139

[45] Willem Hackman: *Seek & Strike: Sonar, anti-submarine warfare and the Royal Navy 1914-54* (London: HMSO, 1984) pp.xxxi-xxxiii & pp.335-352; and Edward C. Whitman: 'SOSUS: The "Secret Weapon" of Undersea Surveillance' in *Undersea Warfare: The Official Magazine of the U.S. Submarine Force* - Winter 2005 volume 7 number 2 - electronic version - http://www.navy.mil/navydata/cno/n87/usw/issue_25/sosus.htm

N.B. For a précis of the history of the1960s British SSN programme lobbying for new 'improved '*Valiant*-class SSNs and also outlining capabilities of Soviet SSNs and SSKs, see TNA: PRO ADM 1/29270 - Secret draft supporting a memorandum from Chief Polaris Executive to DNTWP, dated 19th January 1966. Also, for interesting detail in how the Soviets quietened their boats see Bruce W. Watson and Susan M. Watson (Editors): *The Soviet Navy: Strengths and Liabilities* (Boulder, Colorado: West view Press and London: Arms and Armour Press, 1986) pp.60-61

[46] For example, see Ballantyne: *Hunter Killers* p.324 & p.397; Conley & Woodman: *Cold War Command* pp.85-86, p.161, p.193, pp.203-204; and Sontag and Drew: *Blind Man's Buff* p.91, p.94 & pp.130-131

N.B. The Soviets also developed their own sea-floor acoustic system and had apparently done so *before* the Americans! See Norman Polmar*: The Naval Institute Guide to the Soviet Navy* (Annapolis, Maryland: United States Naval Institute, 1991) p.28 & p.411

[47] Michael Nacht: 'Nuclear Deterrence to the End of the Century' in the *Naval War College Review* (November-December 1983) volume XXXVI number 6 pp.75-76; Milan Vego: 'Submarines in Soviet ASW Doctrine and Tactics' in the *Naval War College Review* (March-April 1983) volume XXXVI number 2 pp.2-16; and Milan Vego: 'The Role of the Attack Submarines in Soviet Naval Theory' in the *Naval War College Review* (November-December 1983) volume XXXVI number 6 pp.48-64

[48] Polmar*: The Naval Institute Guide to the Soviet Navy* pp.28-29, pp.92-93 & pp.114-116; and for additional practical detail, see Ballantyne: *Hunter Killers* pp.194-195, pp.203-204 & pp.393-394; and Sontag and Drew: *Blind Man's Buff* pp.212-213, pp.232-234, p.245 & pp.256-257

N.B. There is also an intriguing statement that one of these Russian SSNs 'attempted to trail a British ballistic missile submarine' in 2010. See Ballantyne: *Hunter Killers* pp.436-437. Also it has been acknowledged that the rate of Soviet counter-detections increased in the 1980s. See Conley & Woodman: *Cold War Command* p.177

[49] Sontag and Drew: *Blind Man's Buff* p.280

[50] Even on the surface in open water, lesser vessels can be dangerous for submarines. For example see Ballantyne: *Hunter Killers* p.215

[51] British Library: British Admiralty Charts numbered 2000 (Gareloch - 2011 edition); 3746 (Loch Long – 2011 edition); 1907 (Firth of Clyde – 2003 edition); 2798 (Rathlin Sound – 2005 edition); and 2635 (West of Scotland – 2011 edition)

N.B. The exit-entry point to deep ocean for SSBNs is clearly stated as the North Channel in Conley & Woodman: *Cold War Command* p.54. Of course, that is not to say that they could not also have gone via Saint George's Channel and the Southwest Approaches

[52] Shallow depths *and* long distances to deep water were specifically mentioned in relation to proposed rock-shelter submarine bases. See TNA: PRO ADM 1/31048 - The Submarine Base of the Future - Appendix B. Also, for general limitations of nuclear-powered submarines in shallow waters, see Vice-Admiral Sir Arthur Hezlet: *The Submarine and Sea Power* (London: Peter Davies, 1967) p.248. For an example of this in practice, see Ballantyne: *Hunter Killers* pp.192-193

[53] Ordered to gain intelligence on merchant traffic in the North Channel, Kapitänleutnant Bernd Wegener, commanding *U27*, entered the Clyde on his own initiative, where he made a number of attacks, including sinking HM Armed Merchant Cruiser *Bayano* on 11th March 1915, with *very* heavy loss of life. See, Arno Spindler: *Der Krieg zur See: Der Handelskrieg mit U-Booten* (Berlin: E.S. Mittler & Sohn, 1933) band II ss.32-34; and NMM: Naval Staff, Training & Staff Duties Division; *Naval Staff Monographs: Home Waters* (1925) volume XIII p.106

[54] TNA: PRO DEFE 69/251

[55] Ballantyne: *Hunter Killers* pp.109-110, p.324 & p.349; and Sontag and Drew: *Blind Man's Buff* p.283

N.B. The location in the last incident is printed as North Sea, but must have been North Channel and may well have been the second incident mentioned in the former book on p.324. Also, there was at least one other detection out in the Northwest Approaches, of a *Whiskey*-class SSK. See Conley & Woodman: *Cold War Command* p.54

[56] Ballantyne: *Hunter Killers* pp.190-194

[57] TNA: PRO ADM 1/31048; DEFE 13/548 - SIXTH JOINT REPORT (1968) OF THE PROJECT OFFICERS FOR THE UNITED STATES AND THE UNITED KINGDOM POLARIS PROGRAMME TO THE SECRETARY OF DEFENSE AND TO THE SECRETARY OF STATE FOR DEFENCE p.1 & p.3; and Captain J.E. Moore RN (Editor): *The Impact of Polaris: The origins of Britain's seaborne nuclear deterrent* (Huddersfield: Richard Netherwood Ltd., 1999) pp.211-212

N.B. The Soviets apparently built rock-protected underground facilities for their *Typhoon*-class SSBNs, at Gremikha, in the early 1980s. See Sontag and Drew: *Blind Man's Buff* p.234. Also, the Norwegian facilities were sold off with unfortunate results. See, 'The Secret Norwegian Submarine Base Being Rented by the Russians', in *Newsweek* ,27th March 2015. See http://www.newsweek.com/2015/03/27/secret-submarine-base-norway-accidentally-handed-russians-314989.html?utm_medium=email&utm_source=emea-email&=

[58] TNA: PRO ADM 201/246

N.B. The scenario of attack that I have envisioned was as a 'bolt from the blue', carried out before reinforcement by RM reservists. Nevertheless, it can be argued that in this proposed reinforcement that real weaknesses would have *remained* and may well, still remain

[59] IISS: *Strategic Survey 2000-2001* (Oxford: Oxford University Press, 2001) pp.118-121; IISS: *Strategic Survey 2001-2002* (Oxford: Oxford University Press, 2002) pp.139-150; IISS: *Strategic Survey 2002-2003* (Oxford, OUP, 2003) pp.116-126; IISS: *Strategic Survey 2004-2005* (London: Routledge, 2005) pp.145-163; IISS: *Strategic Survey 2006* (London: Routledge, 2006) pp.177-196; IISS: *Strategic Survey 2007* (London: Routledge, 2007) pp.185-203; ; IISS: *Strategic Survey 2008* (London: Routledge, 2008) pp.185-207; IISS: *Strategic Survey 2009* (London: Routledge, 2009) pp.195-212; IISS: *Strategic Survey 2010* (London: Routledge, 2010) pp.187-200; IISS: *Strategic Survey 2011* (London: Routledge, 2011) pp.223-230; IISS: *Strategic Survey 2012* (London: Routledge, 2012) pp.171-197; IISS: *Strategic Survey 2013* (London: Routledge, 2013) pp.153-174; IISS: *Strategic Survey 2014* (London: Routledge, 2014) pp.151-175; and IISS: *The Military Balance 2015* (London: Routledge, 2015) pp.159-160, p.160 & pp.168-173

[60] IISS: *The Military Balance 2000-2001* (Oxford: OUP, 2001) pp.111-112, pp.115-117, p.120 & pp.121-124; IISS: *The Military Balance 2001-2002* (Oxford: OUP, 2002) p.112 & pp.113-116; IISS: *The Military Balance 2002-2003* (Oxford: OUP, 2003) p.88 & p.90-92; IISS: *The Military Balance 2003-2004* (Oxford: OUP, 2004) pp.88-89 & pp.90-92; IISS: *The Military Balance 2004-2005* (Oxford: OUP, 2005) p.99, p.104 & pp.105-107); IISS: *The Military Balance 2005-2006* (Oxford: OUP, 2006) p.158 & pp.159-162; IISS: *The Military Balance 2006* (London: Routledge, 2006) p.149, p.154 & pp.155-158; IISS: *The Military Balance 2007* (London: Routledge, 2007) p.195 & pp.196-203; IISS: *The Military Balance 2008* (London: Routledge, 2008) p.206, p.212 & pp.213-217; IISS: *The Military Balance 2009* (London: Routledge, 2009) p.217 & pp.218-226; IISS: *The Military Balance 2010* (London: Routledge, 2010) p.222 & pp.223-231; IISS: *The Military Balance 2011* (London: Routledge, 2011) p.183 & pp.184-187; IISS: *The Military Balance 2012* (London: Routledge, 2012) p.183, p.187, p.192 & pp.194-202; IISS: *The Military Balance 2013* (London: Routledge, 2013) pp.202-203, p.225 & pp.227-234; IISS: *The Military Balance 2014* (London: Routledge, 2014) p.163, p.180 & pp.182-185; and IISS: *The Military Balance 2015* pp.163-164, pp.164-165 & p.185

N.B. One of the *Delfin*-class boats had been damaged, but was due back in commission in 2014

[61] Sam LaGrone: 'Russian Foreign Minister: No Need for NATO in the Arctic' in the *USNI News*, 22nd October 2014 - http://news.usni.org/2014/10/22/russian-foreign-minister-need-nato-arctic; IISS: *The Military Balance 2015* p.159; and Da Vinci AG: Russia's Military Buildup in the Murmansk in *New Eastern Europe* 30th January 2015 - http://neweasterneurope.eu/articles-and-commentary/1468-russia-s-military-buildup-in-the-murmansk-oblast

[62] Originally begun in 1969, these negotiations were held between the United States and the Soviet Union. The first tranche of Strategic Arms Limitation Talks, generally known as SALT I, essentially stabilized the numbers of launching systems, as of 1972. Following on until 1979, SALT II then aimed at cutting production of strategic nuclear weapons. The latter was not ratified by the

US (at least partly due to the Soviet invasion of Afghanistan). Eventually, however, the Strategic Arms Reduction Treaty, or START (later renamed START I), was signed in 1991. Coming into force in 1994, this brought about a reduction of around 80 per cent of strategic nuclear weapons. New Start, as of 2010, continued in this vein.

[63] IISS: *The Military Balance 2015* p.40

[64] Parliamentary Archives: HMG: *The Strategic Defence Review* (HMSO, 1998) (Cm. 3999) p.18

[65] HMG: *The Future of the United Kingdom's Nuclear Deterrent* 2006 p.5, p.8, p.12, p.13 & p.17

[66] HMG: *Securing Britain in an Age of Uncertainty* 2010 pp.38-39
N.B. The figures for missiles and warheads deployed cannot necessarily be taken as accurate. Even respected defence publications are vague in these matters. For example, see *The Military Balance 2014* (London: The International Institute for Strategic Studies, 2014) p.151

[67] PA: HMG: *The Strategic Defence Review* 1998 p.19

[68] HMG: *The Strategic Defence Review* 1998 p.18; and Conley & Woodman: *Cold War Command* p.257

[69] BL: HMG: *The Strategic Defence Review* 1998 Supporting Essay 5 - Deterrence, Arms Control and Proliferation p. 5-2 & p.5.-3

[70] Defence Committee: *A New Chapter to the Strategic Defence Review* - Sixth Report of Session 2002-03 - Volume I: Report (HC 93-1) p.7

[71] Conley & Woodman: *Cold War Command* p.257; and Paul Rogers: 'A Note on the British Deployment of Nuclear Weapons in Crises - with particular reference to the Falklands and Gulf Wars and the purpose of Trident' in *Lobster 28* (Hull: Robin Ramsay) December 1994 pp.2-10
N.B. The maximum range for the Trident D5 with reduced loads would appear to be approximately 7,000 nm. See http://en.wikipedia.org/wiki/UGM-133_Trident_II

[72] HMG: *The Future of the United Kingdom's Nuclear Deterrent* 2006 p.18
N.B. This follows the thinking of one very influential civil servant. See Ogilvie-White: *On Nuclear Deterrence* pp45-46, pp.60-61, p.65 & pp.89-103

[73] Baylis and Stoddart: *The British Nuclear Experience* p.191

[74] Confidential source
N.B. This cannot be definitively confirmed unless the relevant tactical handbook is released for public scrutiny

[75] HMG: *Securing Britain in an Age of Uncertainty* 2010 p.38

[76] TNA: PRO CAB 130/1160 - Annex C to Misc & (81)1 17th November 1981 p.2 & Appendix I - Trident Submarine: Propulsion and Tactical Weapons Systems ; and HMG: *The Future of the United Kingdom's Nuclear Deterrent* 2006 p.26

[77] 'Commander needed to sort out nuclear weapons 'mess'' in *The Times* 16th April 2015 p.4

[78] Lucas: *The New Cold War* p.xv, pp.145-154, pp.169-175, pp.178-243 & pp.253-260; Judah: *Fragile Empire* pp.161-166; and for the primary actions taken in Europe, as imposed by the European Union, see 'EU sanctions against Russia over Ukraine crisis' at http://europa.eu/newsroom/highlights/special-coverage/eu_sanctions/index_en.htm#4

[79] Daily reports from the Organisation for Security and Cooperation in Europe (OSCE) show something of these complexities that have not been reported in the mainstream western media. See osce-subscriptions@osce.org. There also many other reports in online news outlets and from organisations, such as think tanks. As for *Maskirovka*, once again there is much online, whether examples of this, or in denouncing it. For one explanatory item see Walter Lacquer: 'Putin and the Art of Political Fantasy' in *Standpoint* (January-February 2015) at http://standpointmag.co.uk/node/5889/full

[80] For recent online examples of such possibilities, see Luke Johnstone: 'Georgian FM Says South Ossetia Could Be Annexed Like Crimea' on Radio Free Europe - Radio Liberty 29th January 2015. See http://www.rferl.org/content/georgia-ossetia-russia-ukraine-annexation-fears-crimea/26820543.html; 'Latvia calls for the convening of an extraordinary Foreign Affairs Council Meeting' 21st January 2015, see http://www.mfa.gov.lv/en/news/latest-news/44443-latvia-calls-for-the-convening-of-an-extraordinary-foreign-affairs-council-meeting; and Delphi: 'Lithuanian president on Holocaust Day: Some people in Europe won't acknowledge today's aggressor' in the *Lithuanian Tribune* 27th January 2015, see http://en.delfi.lt/lithuania/foreign-affairs/lithuanian-president-on-holocaust-day-some-people-in-europe-wont-acknowledge-

todays-aggressor.d?id=67012162

[81] Adrian Croft: 'UK concerned over 'threatening' Russian nuclear strategy' as reported by Reuters 6th February 2015. See http://www.reuters.com/article/2015/02/06/us-ukraine-crisis-fallon-idUSKBN0LA2CO20150206; and 'Russia Beefs Up Ballistic Missile Launchers Patrolling' on Radio Free Europe - Radio Liberty 6th February 2015. See http://www.rferl.org/content/russia-beefs-up-ballistic-missile-launchers-patrolling/26833523.html

[82] 'Russian Defense Policy' at https://russiandefpolicy.wordpress.com/2012/02/05/ssbn-patrols/; https://russiandefpolicy.wordpress.com/tag/ssbn/; and 'Russian Navy Chief: Submarine Patrols Up 50 Percent Over Last Year' in the *USNI News* 19th March 2015 at http://news.usni.org/2015/03/19/russian-navy-chief-submarine-patrols-up-50-percent-over-last-year?utm_source=USNI+News&utm_campaign=677f93304e-USNI_NEWS_WEEKLY&utm_medium=email&utm_term=0_0dd4a1450b-677f93304e-230936853&mc_cid=677f93304e&mc_eid=5cce7efa1c

N.B. With only two SSBNs in the Pacific Fleet maintaining CASD may have been problematical. However, there are now three SSBNs there. See IISS: *The Military Balance 2015* p.195

[83] Reported just before publication is yet another incident in Finnish waters, probably relating to a Russian submarine. See 'Finnish military fires depth charges at suspected submarine' through Reuters 28th April 2015, see http://www.reuters.com/article/2015/04/28/us-finland-navy-idUSKBN0NJ0Y120150428

[84] Jonathan Beale: 'UK called on Nato help in sub search' on BBC News Scotland 9th December 2014 at http://www.bbc.co.uk/news/uk-scotland-30398114; and Victoria Ward: 'A Suspected Russian Submarine Is Lurking Off Of The Scottish Coast' in *The Telegraph* 9th January 2015, as reported online at http://www.businessinsider.com/a-suspected-russian-submarine-is-lurking-off-of-the-scottish-coast-2015-1?IR=T

N.B. As further reported, the use of MPA in force protection was claimed. See 'Loss of Nimrods raises fears of risk to UK's nuclear subs as Russia grows bold' in the *Financial Times* 29th December 2014 p.1. Also see 'Renewed focus on underwater warfare calls Nimrod scrapping into question' ibid. p.3. Also, old friends, in the shape of AGIs are also back in business. See Bill Gertz: 'Russian Intel Ship Spying on US Missile Submarines' in *The Washington Free Beacon* 13th February 2015 at http://freebeacon.com/national-security/russian-intel-ship-spying-on-us-missile-submarines/; and Dave Sloggett: 'Spy ships menace is back in vogue' in *Warships International Fleet Review* May 2015 pp.12-14

[85] HMG: *Securing Britain in an Age of Uncertainty* p.27; 'Future UK Maritime Patrol' on Thinkdefence 9th April 2012 at http://www.thinkdefence.co.uk/2012/04/future-uk-maritime-patrol/; and 'U.K. Maritime Patrol Capability Re-Enters Fray' in *Aviation Weekly* 12th September 2013 at http://aviationweek.com/defense/uk-maritime-patrol-capability-re-enters-fray

[86] Conley & Woodman: *Cold War Command* p.93

[87] It should be noted that there is more than one way of looking at this, as can be proven from history. For instance, as the *Kaiserliche Marine*'s submarines engaged in completely unrestricted and highly effective *Handelskrieg* (trade war) against British, Allied and neutral merchantmen in the early months of 1917, there were calls to increase convoying. Among naval arguments against this was that when enemy submarines found convoys they would do great damage. While not entirely untrue, out of coastal waters it proved difficult for the U-boats to find the convoys. Of course, the way of locating these merchantmen was to operate in coastal water choke points. This argument can be applied to ASW operations (on both sides) nowadays. Enemy SSNs would still have problems finding Allied SSBNs in deep ocean, but would increase their chances by inhabiting the choke points. Therefore, Allied ASW forces need to also concentrate their resources on these same waters, in effect new battles of the Narrow Seas. For the 1917 RN thinking as mentioned above, see John Terraine: *Business in Great Waters: The U-Boat Wars 1916-1945* (London: Leo Cooper, 1989) pp.52-53

[88] Sam LaGrone: 'U.S. Denies Attack Submarine 'Expelled' From Barents Sea' in the *USNI News*, 11th August 2014. See http://news.usni.org/2014/08/11/u-s-denies-attack-submarine-expelled-barents-sea; and Kyle Mizokami: 'Russia Playing Politics With Alleged Submarine Confrontations' in the *USNI News*, 26th August 2014, see http://news.usni.org/2014/08/26/russia-playing-politics-alleged-submarine-confrontations

N.B. There are also other related pieces on the US Naval Institute's website

[89] Sam LaGrone: 'Russian Foreign Minister: No Need for NATO in the Arctic' in the *USNI News*, 22nd October 2014 at http://news.usni.org/2014/10/22/russian-foreign-minister-need-nato-arctic; and Tim Ripley: 'Ice damage evident as UK SSN returns home' in *IHS Jane's Defence Weekly* 7th April 2015 at http://www.janes.com/article/50488/ice-damage-evident-as-uk-ssn-returns-home?utm_campaign=PC6110_

E15%20DF%20NL%20Naval%20%2004_14_15&utm_medium=email&utm_source=Eloqua

[90] HMG: *The Future of the United Kingdom's Nuclear Deterrent* 2006 pp.9-11; and HMG: *Securing Britain in an Age of Uncertainty* 2010 pp.38-39

[91] HMG: *Submarine Initial Gate Parliamentary Report* 2011 p.2, pp.4-7 & p.9

[92] Ibid. p.4 & p.10

[93] 'Pegasus grounded: vital Trident bomb project 'on hold' after problems' in the *Herald Scotland*, 8th March 2015. See http://www.heraldscotland.com/news/home-news/pegasus-grounded-vital-trident-bomb-project-on-hold-after-problems.120130054

[94] 'UK funds Successor submarine design work through to production decision' in *IHS Jane's Defence Weekly* 10th March 2015. See http://www.janes.com/article/49894/uk-funds-successor-submarine-design-work-through-to-production-decision

[95] HMG: *Trident Alternatives Review* 2013 p.29; and additional information from a highly confidential and non-attributable source

[96] HMG: *Trident Alternatives Review* 2013 pp.10-11

[97] *Defending the Future: UK Defence in the 21st Century* - Policy Paper 112 - autumn 2013 (downloadable pdf) pp.20-21

[98] Certainly in the days of *Polaris* boats, from personal experience, operations branch crew-members would have greatly valued having *any* protection from the elements. My understanding is that while there have subsequently been improvements both at Faslane and Coulport, cover remains limited
N.B. There is a fascinating photograph of a *Vanguard*-class boat in refit, showing the state of her hull below the waterline. See 'HMS Vigilant LOP(R) - Babcock International Group' (downloadable pdf)

[99] As an example of a design fault in *Swiftsure*-class SSNs, see Ballantyne: *Hunter Killers* p.230

[100] Confidential source

[101] Some types of system training and practice can be conducted ashore on simulators, but this cannot replace proper sea time and experience. In the case of attack teams, to be effective this needs the full teams to train together: including commanding and executive officers. Incidentally, the RN apparently became very keen on such training aids during the Second World War. For example see TNA: PRO ADM 1/18969 - Synthetic Training Devices - Preparation of Naval List, dated 7th June 1943

[102] Ministry of Defence: *Annual Report and Accounts 2013-2014* p.42 & p.44. See https://www.gov.uk/government/publications/the-ministry-of-defence-annual-report-and-accounts-2013-to-2014
N.B. There have been past shortages in the Submarine Service that were made up by drafting from General Service. However, with poor morale in some branches, the retention rate was not necessarily high. This is written from personal experience, having both been drafted and subsequently opted to leave the Service *far* earlier than I had originally planned

[103] For instance, British *A*-class submarines that were built for service in the Pacific were basically unsuitable for Arctic patrols: not having efficient heating. See Ballantyne: *Hunter Killers* p.82. Also, For a Soviet example clearly mentioned in a relatively recent television documentary, see *The Silent War*, BBC2, broadcast on 12th December 2013. Five *Victor III* class boats that had been designed for service in cold northern waters were deployed to the Sargasso Sea in spring of 1987 and apparently conditions onboard were foul. All sorts of other practical difficulties can also arise after refits.

[104] It can be opined that these are not helped by continuing with one particular thought process, in using the deterrent to restore deterrence. See HMG: *Trident Alternatives Review* 2013 p.13. Not new, this had already been espoused by Michael Quinlan. See Ogilvie-White: *On Nuclear Deterrence* pp.46-47

[105] HMG: *Securing Britain in an Age of Uncertainty* 2010 p.37 & p.38

[106] HMG: *The Future of the United Kingdom's Nuclear Deterrent* 2006 p.19

[107] The latter, intriguingly, may have been HMG's intention in the Falklands War in 1982

[108] *Far* more complexities in operating multi-role SSBNs (or SSGNs) can also be envisioned. In the case of a semi-permanent emergency in South East Asia, other than using the few remaining US naval bases, it would be difficult finding anywhere for shore support. Incidentally, basing them in Bahrain would probably be utterly incendiary, as well as militarily risky

[109] *Decision-Making in Defence Policy: Eleventh Report of Session 2014-15* at http://www.publications.parliament.uk/pa/cm201415/cmselect/cmdfence/682/68202.htm

N.B. Even although this report is critical, it still suffers from significant weaknesses. For example, in regards to the deployment of very limited forces to widely scattered and isolated outposts in Helmland in 2006 it is stated that it was only hindsight that identified this as mistaken. However, this bitter lesson had already been learned by the British in the same area - in the 19th century.

[110] This seems to have been confirmed. See Josh Cohen: 'With 580 U.S. boots on the ground in Ukraine, what's Vladimir Putin's next move?' through Reuters at http://blogs.reuters.com/great-debate/2015/04/23/with-u-s-boots-on-the-ground-in-ukraine-whats-vladimir-putins-next-move/