

Replacing Polaris

In 1978 the Callaghan government produced a report, “Future of the UK Nuclear Deterrent”. This subsequently led to the decision to purchase Trident.¹ 30 years later, as the current Labour Government prepared to replace Trident with a new nuclear weapon system, parts of this report were removed from the National Archive and reclassified. This paper attempts to rebuild the contents of this crucial paper and consider its implications for today.

The document had two principle authors: Sir Anthony Duff, Deputy Under Secretary of State at the Foreign Office, and Sir Ronald Mason, Chief Scientific Adviser at the Ministry of Defence (MoD). It became known as the Duff-Mason report and had three parts:

1. The politico-military requirement
2. The criteria for deterrence
3. System options and their implications

The report was classified Top Secret UK Eyes A. Part 1 is available in the National Archive. Part 2 was placed in the Archive in 2006 and then withdrawn the following year. One annex to Part 2 was publicised in the Sunday Herald.² Part 3 has not yet been released.³

In July 1979, after the Thatcher Government took office, the Chiefs of Staff agreed to produce a commentary on the report. This was drafted by the Defence Policy Staff and is referred to in this paper as the Commentary. It was placed in the National Archive in 2006. In 2007 it was reviewed by the MoD and a redacted version of the paper returned to the Archive.⁴ In December 2008 an article Kristan Stoddart on the history of British nuclear targeting was published which gives an insight into the report and Commentary.⁵

In February 2009 an MoD spokesperson explained why they had removed parts of the report and redacted the Commentary –

“The papers were sensitive because they contain information relevant to the current deterrent or to any follow-on system. Leaving the papers in the public domain could have compromised national security and affected bilateral relationships.”⁶

¹ In January 1979, shortly after the report was completed, Callaghan sought and received President Carter’s assurance that the US was willing to sell Trident. When he left office Callaghan passed the Duff-Mason report to his successor, Margaret Thatcher. She made the agreement to acquire Trident from the US in July 1980.

² Sunday Herald 8 February 2009; <http://robedwards.typepad.com/files/unacceptable-damage.pdf>

³ Factors relating to the future consideration of the future of the United Kingdom nuclear deterrent, The National Archive DEFE 25-335 E44 part1 (Duff-Mason Report)

⁴ The future of the UK nuclear deterrent – A commentary, DEFE 25-335 (Commentary)

⁵ Maintaining the “Moscow Criterion”: British Strategic Nuclear Targeting 1974 -1979, Kristan Stoddart, The Journal of Strategic Studies, Vol 31 No 6, December 2008, page 916 – 918.

⁶ Revealed: the nuclear horror that justified Trident, Rob Edwards, 8 Feb 2009 www.robedwards.com

Part 1 The politico-military requirement

The report identifies four interrelated purposes for British strategic nuclear weapons:

1. Numerical contribution to NATO nuclear forces
2. Second centre of decision making
3. Independent defence of national interests
4. Political status and influence

The second and third were considered as the key purposes.⁷

1. Numerical contribution to NATO nuclear forces

In 1979 Britain allocated 28 Polaris missiles to SACEUR. One submarine was on patrol with 16 missiles at 15 minutes notice to fire. A further 12 were available on a second submarine. This vessel was normally at Faslane at 24 hours notice to fire missiles from the berth and at 48 hours notice to take to sea.⁸

Although it enabled SACEUR to attack 28 targets at long range this force was only a small part of NATO's arsenal of thousands of nuclear weapons. Its significance to the overall NATO nuclear plan was questionable. Michael Quinlan has said the missiles were "notionally" allocated targets in the NATO plan. The Duff-Mason report says that the contribution made by British forces to SACEUR's nuclear plan should not be exaggerated.⁹ David Owen said that they amounted to only 5 % of NATO's nuclear force.¹⁰

The circumstances in which these forces would be released to NATO were limited -

"it is a clear, if necessarily implicit, assumption in our planning that the Polaris force would not be released for use in its NATO role short of a general war involving the United States strategic forces".¹¹

The missiles would only have been used against their NATO-assigned targets when it was assessed that there was no need to retain an independent capability. This would not have been the case where there was a limited US nuclear attack on Soviet targets. The British force would probably only have been released to SACEUR if there was a general release of US strategic nuclear forces.

2. Second centre of decision making

The Duff-Mason report argues that the significance of the UK's contribution to NATO nuclear forces was not in their size but in the potential for them to be used without US authorisation in defence of Britain's allies in Europe. However it recognised that this Second-Centre argument could undermine deterrence. It could indicate a lack of confidence in the US nuclear commitment to NATO.

⁷ Commentary para 4

⁸ DEFE 25-335 E31 page 2

⁹ Duff-Mason Part I para 20

¹⁰ Nuclear Papers, David Owen, Liverpool University Press, 2009, p 131.

¹¹ Duff-Mason Part I para 20

An independent British capability had to be held in reserve in case the United States hesitated about crossing any threshold. This could be the threshold of using nuclear weapons on the battlefield, beyond the immediate battlefield, or against targets in the Soviet Union.¹² In all these circumstances Britain had to retain an ability to act on its own.

The Duff-Mason report recognised the weakness of this argument. If the United States, with its immense nuclear arsenal was not willing to push a conflict to the next level, how could it be credible for Britain, with its far smaller nuclear force, to threaten to do so ?

“It cannot be assumed that (given our much greater vulnerability that the United States to nuclear attack) that a British Government would be readier than the United States President to engage in nuclear escalation that might provoke Soviet retaliation against our territory, even in circumstances in which British forces (like United States forces) might be facing defeat in combat”¹³

The report argued that what was important was that the Soviet Union would not be able to rule out this possibility. It said that this requirement might best be met by an ability to launch limited nuclear strikes which would raise the conflict to a level where the US would be more likely to participate. But yet Polaris and Trident are particularly ill suited for limited strikes.

Duff-Mason gives another scenario in which the Second Centre argument would come into play. This is where there was a long-term decline in the US commitment to Europe. Were this to arise then British and French nuclear forces might to a degree replace those of the US. But the British Polaris and Trident systems would not be of any help in this situation. The UK only held enough spare parts at Faslane to operate Polaris for 9 months. Neither Polaris nor Trident could be sustained for long without US support.

3. Independent defence of national interests

The existence of an independent nuclear capability was fundamental to the Second-Centre argument. The Commentary said that without an independent capability to inflict unacceptable damage the threat to use nuclear weapons in support of NATO was a bluff and would be seen as such.¹⁴

The independent capability was also presented as an insurance against the break up of NATO. However the Polaris and Trident systems, with their dependence on US support, may not have survived any collapse of the alliance.

The report acknowledges that it could be argued that the circumstances in which an independent capability might have been required were so unlikely that they didn't in themselves justify a strategic nuclear capability.

Faced with the situation where the Soviet Union had launched a nuclear attack on Britain there would be no logical reason for British nuclear weapons to be used in response -

¹² Duff-Mason Part I para 23

¹³ Duff-Mason Part I para 23

¹⁴ Commentary para 7

“In these circumstances the actual use of our strategic nuclear force in retaliation against the Soviet Union would represent an act of rage and revenge ... there can be no certainty that a Government would take a deliberate decision to launch this act involving the killing of large numbers of enemy civilians but serving no rational purpose”.¹⁵

The credibility of the deterrent rested on the possibility that decision makers in Britain would cast reason and ethics aside –

“Ultimate deterrence is perceived to work, because no nuclear weapons state (NWS) can feel confident enough to act on a judgement that an adversary, seeing the painful destruction of all that he most valued, would withhold retaliation on account of some cool calculation based on ethics and utility”.¹⁶

In 2008 Peter Hennessey interviewed officials and politicians about nuclear decision making. He asked David Young, a former nuclear planner, what advice he would have given to Ministers if Russian missiles were heading towards Britain. Mr Young replied -

“We’ve failed. It is absolutely pointless to retaliate. Keep your nuclear arsenal. Hope that it might be a bargaining chip with somebody. If need be put them under command of the Australians ... it’s tragic, but it’s pointless to retaliate”.¹⁷

When he was Defence Minister Denis Healey had the authority to release nuclear weapons if Prime Minister Harold Wilson was not available. Mr Healey also said that if the crunch came he would not have ordered their use -

“I would have said that there is no reason for doing something like that. Because most of the people you kill would be innocent civilians.”¹⁸

Peter Hennessey’s interviews suggest that there was a difference in outlook between the policy makers, who thought in terms of deterrence, and the military officers, who practiced executing their Doomsday orders. The Duff-Mason report reveals that deterrence policy did not rest on certainty, but only on a possibility that could not be totally discounted. In contrast Admiral Sir Nicholas Hunt, who as Commander in Chief Fleet had been in operational command of the Polaris fleet from 1985 to 1987, said:

“Trident ensures that any country wishing to attack the UK with strategic weapons will know in advance, *with absolute certainty*, that in return it will be attacked with similar weapons causing unacceptable damage”.¹⁹

Within this subtle difference in interpretation between civil servants and Admirals lies the potential for catastrophic disaster.

4. *Political status and influence*

¹⁵ Duff-Mason part I para 11

¹⁶ Duff-Mason part I para 12

¹⁷ The Human Button BBC Radio 4 2 December 2008

¹⁸ HMS Apocalypse, Peter Hennessey & Richard Knight, Daily Mail, 29 November 2008.

¹⁹ Letter to The Times from Admiral Sir Nicholas Hunt 21 January 2009

Both the Duff-Mason report and the Commentary stress what might be lost if Britain were to give up its status as a nuclear power. The report argued that nuclear weapons were important for Britain's standing in Europe. They meant that Britain had a special place within NATO, second only to the US. The Chiefs of Staff said that without nuclear weapons Britain would be in a lower position within the Alliance than Germany.²⁰ There was also a clear concern that this would leave France as the only nuclear-armed power in Europe. As an earlier document pointed out, passing nuclear hegemony to the French was something which the British Government did not want to contemplate.²¹

Part 2 Criteria for Deterrence

In 2007 the MoD withdrew the second part of the Duff-Mason report from the National Archives because it contained "information relevant to the current deterrent or to any follow-on system". However, it is possible to piece together some of its contents.

In May 1979 Michael Quinlan, then Deputy Under Secretary at the MoD, wrote a briefing for the incoming Thatcher Government which said:

"Plans for the UK strategic deterrent in its national (as distinct from NATO) role are based on the assessment that the threat to inflict unacceptable damage on the Moscow area is required".²²

The Moscow criterion had been an essential justification for the expensive and problematic Chevaline programme. But the Moscow ABM system was becoming too effective for Polaris before Chevaline entered service. In the late 1970s the MoD had been forced to look at alternatives – only being able to carry out their plan when two submarines were on patrol, deploying a submarine to the Mediterranean to outflank the ABM radar, or targeting a number of Soviet cities but not Moscow.

The Duff-Mason report presented four options, two of which excluded Moscow. These options are at the heart of Part 2 of the report and have been described in similar terms by two sources.

While these options were illustrative the Commentary says that they were likely to become the measure against which future requirements were judged. These options were still considered to be the key criteria in studies carried out by the Thatcher Government at the end of 1980.

²⁰ Commentary para 12

²¹ TNA DEFE 19-208 E05-2 page 2

²² Briefing New Ministers, Strategic and Theatre Nuclear Forces, ME Quinlan, 2 May 1979, DEFE 25-335 E58(i)

Duff-Mason Deterrence Criteria Options

Option	Source 1 ²³	Source 2 ²⁴
1	To destroy the command centres of the Soviet political and military systems (both above and below ground) inside the Moscow ring road and extra ones in the wider Moscow area.	Disruption of the main governmental organs of the Soviet state.
2	To inflict a level of damage that would cause the breakdown of normal life in Moscow, Leningrad plus two more big cities.	Breakdown level damage to a number of cities including Moscow.
3a	To inflict breakdown on 10 big cities West of the Urals, including Leningrad.	Breakdown level damage to significantly larger number of cities than option 2, but without Moscow or any other city within anti-ballistic missile (ABM) coverage.
3b	To inflict lesser damage on 30 big targets (also including Leningrad)	Grave, but not necessarily breakdown level, damage to 30 major targets outside ABM coverage.

The Duff-Mason report said that any of the four options would constitute an unacceptable level of damage.²⁵ However the Chiefs of Staff challenged this assumption. They argued that there would be circumstances when Option 3b would be insufficient. In July 1979 preparations were being made for a visit to Washington to discuss nuclear issues. Commodore Hill submitted comments on a briefing for this visit. He pointed out that some of the content of the Duff-Mason report had been drafted to suit the previous Labour Government and said –

“as a particular point the Chiefs of Staff have reservations about criteria option 3b (30 bangs on 30 cities)”.²⁶

The minutes of a Chiefs of Staff committee meeting in August 1979 confirm this –

“Should the point arise, you may wish to remind colleagues that Option 3(b) (30 bangs in 30 places) is a surviving fragment of the so called “Owen Criteria” of “a million dead” which was to support the case for a cruise missile option”.²⁷

David Owen did suggest this figure of 1 million fatalities, but in the context of arguing that all three options set too high a threshold rather than in support of Option 3(b). He said that all three options “impose an unnecessarily high and detailed threshold of

²³ Cabinets and the Bomb page 324. In a footnote Peter Hennesey says that this was “private information” that he had obtained. Options 1 and 3b are confirmed in DEFE 25-335. Option 3a is confirmed in PM/78/145, Nuclear Papers, David Owen, Liverpool University Press, 2009, p 158.

²⁴ Commentary, DEFE 25-335, as quoted in K Stoddart. This text has been redacted from the version of the Commentary currently available in the National Archive.

²⁵ Duff-Mason report Part 2 Annex A Unacceptable Damage para 10

²⁶ Letter from Commodore Hill to CDS 12 July 1979, DEFE 25-335 E82

²⁷ Minutes of Chiefs of Staff Committee 21 August 1979, DEFE 25-335 E100;

destructive capability”.²⁸ He argued that a nuclear capability which fell short of the three options might still be able to inflict unacceptable damage.

Option 3a, targeting 10 cities other than Moscow, had earlier been suggested by Field Marshal Carver when he was Chief of Defence Staff. He raised this option in 1975 as a temporary expedient until Chevaline entered service.²⁹

Option 1, an attack on command posts in the Moscow area, was described as “the loss of governmental control, with great collateral damage”.³⁰ The Chiefs of Staff favoured this option. They argued that it was suited to many circumstances, including “advanced escalation”. This refers to the situation where a lower level of nuclear response had failed. In comparison with the other options, attacking the command centres would leave the Soviet Union most vulnerable to an attack from the United States or China. It is likely that the Duff-Mason report itself also favoured Option 1.

In due course Option 1 appears to have become the principle basis for targeting Trident. Field Marshall Nigel Bagnall said “It is more than just the destruction of Moscow, it is the destruction of their command and control system”³¹. Richard Mottram had been the secretary of the Duff Mason Committee and he later became Permanent Under Secretary at the MoD. In an interview in January 2008 he said that the policy meant “threatening where the key players in Soviet Government operate from”.³² Michael Quinlan has made statements which are consistent with targeting the command bunkers, although he has avoided stating this clearly. He has pointed out that the ABM system protected more than just Moscow and that Britain’s deterrent would be undermined if these other objects were immune from attack.³³ The official phrase used in the 1980s to describe the nuclear targets was “key aspects of Soviet power”.

Part 2 Annex Unacceptable Damage

Part 2 of the Duff Mason report included an Annex with the title “Unacceptable Damage”. This was released in 2006. In 2007 the MoD recalled it. However the annex has been published online.³⁴

The annex identifies four key capabilities that might be attacked:

1. Governmental capabilities
2. Military facilities
3. Military research, development and production and general industrial capabilities
4. Generalised destruction

Capabilities 2 and 3 were dealt with briefly. It was felt that an attack on military facilities would not in itself cause unacceptable damage, although such attacks were not ruled out. It was acknowledged that Britain could not present an effective threat to

²⁸ Letter from David Owen to Jim Callaghan, 11 December 1978, PM/78/138, Nuclear Papers, David Owen, Liverpool University Press, 2009, p 150.

²⁹ DEFE 13-1039; K Stoddart p 906

³⁰ Commentary para 15

³¹ Moscow Criterion, BBC, Broadcast July 1995

³² Recording of PONI interview with Richard Mottram, 15 min 40 secs.

³³ Seminar on Cabinets and the Bomb.

³⁴ Sunday Herald 8 February 2009; <http://robedwards.typepad.com/files/unacceptable-damage.pdf>

Soviet missile silos. It was also felt that the loss of even carefully selected military-industrial capabilities in the Soviet Union would not be decisive.

In assessing the significance of Governmental capabilities the annex argues that the construction of command bunkers in and around Moscow, protected by the ABM system, was a sign of the high value placed by Soviet leaders on the survival of their centralised administrative system. In addition to bunkers within Moscow there were 90 underground facilities around the city. 27 of these were believed to be for the use of the national political and military leadership and for operational control of Soviet armed forces. A map of the national-level command and control bunkers was attached to the Annex. This pinpointed 7 sites outside the Moscow Ring Road. Some of these, such as Sharapovo and Checkov, are not single facilities but complexes of bunkers spread out over large areas. These parts of the annex were clearly linked to Option 1 – an attack on command centres.

Most of the annex deals with the fourth heading, “generalised destruction”. This describes attacks on cities. Such attacks would destroy not only military and industrial facilities in the area but would also “threaten more general damage to the infrastructure of Soviet society and widespread civilian deaths and casualties”.³⁵ It was argued that the Soviet Union placed great value on some cities, particularly Leningrad and Moscow.

The existing basis for calculating how much damage should be inflicted on a city in a nuclear attack was described:

“the damage criterion used is based not on destroying the whole city or killing a specified number of people but instead on creating sufficient damage to bring about the breakdown of the city as a functioning community. Our present plans assume that, to achieve this, 40% of the target area should suffer severe structural damage (SSD) – that is, its unhardened buildings should be so damaged that they could not be used for their intended purpose without essentially complete reconstruction.”³⁶

The results of such an attack would be –

“at least 40% of those in the city at the time of the attack would be likely to be killed outright, a further 15% might be so seriously injured that they needed to be treated in hospital, and another 15% might suffer light injury”.³⁷

In the annex these existing criteria for Unacceptable Damage were reviewed. The conclusion was that the 40% irreparable damage figure remained appropriate. However if this was very difficult to meet a somewhat lower figure could be acceptable.

The authors of the annex were concerned about Soviet plans to build shelters for essential workers and that by 1985 there could be shelters for 30% of the population. Their response was to evaluate the effect of detonating warheads as a ground-burst rather than airburst. This would half the area subject to major blast damage, but would greatly increase the danger from radioactive fallout. The effect of using the same number of warheads as originally projected, but in ground-bursts rather than air-bursts, is described for the city of Leningrad–

³⁵ Duff-Mason Part II Annex A para 4

³⁶ Duff-Mason Part II Annex A para 5

³⁷ Duff-Mason Part II Annex A para 5. This assumes a uniformly distributed population.

“in near-still-air conditions ground-bursts would subject 55-60% of the city to a radiation dose sufficient to cause rapid debilitation followed by death for most people in the area, and to contaminate food, water, air and both damaged and undamaged buildings. Residual radiation would remain a hazard for many years to come. If there was a wind, the fall-out would be carried beyond the city limits to extend the hazard to people locally dispersed.”³⁸

The annex argued that so long as Britain had the option of detonating warheads as ground-bursts, the Soviet Union could not rely on civil defence as a means of countering the British nuclear deterrent.

Part 3 System options and their implications

This part of the report is not currently available in the National Archive. It looked at a range of delivery systems. Having eliminated all non-submarine options, it considered in detail both Submarine Launched Ballistic missiles (SLBM) and Submarine Launched Cruise Missiles (SLCM).

David Owen had presented a separate paper with the case for Cruise. The main argument against Cruise was that the MoD could not predict the proportion of missiles that would reach their target. It might be anywhere between 1:10 and 9:10. The Duff-Mason report appears to have used the most pessimistic assumption. It was then argued that a large number of submarines would be required to deliver these missiles. 300 cruise missiles would need to be launched to have a 50 % chance of inflicting unacceptable damage on the 10 cities in Option 3a.³⁹ In response David Owen wrote to the Prime Minister arguing that Cruise should still be considered. He argued that the number of cities to be attacked could be reduced, resulting in a proportionate reduction in the number of cruise missiles needed.

The Commentary came down clearly against Cruise – “we could not responsibly recommend a CM solution”.⁴⁰

Part 3 contained an assessment of the number of warheads that would be delivered to meet each of the four damage criteria options. The Commentary says that the number of warheads that would be delivered for Option 1 was about double the number for any other option. This is significant, because this is the option that determined how many warheads were needed. Attacking the bunkers would require twice as many warheads as attacking Moscow, Leningrad and two other cities in Option 2.

In Option 1 the warheads would have been detonated in ground-bursts, resulting in far more radioactive fallout. As their own analysis for ground-burst strikes on Leningrad had showed, this could result in more deaths.

Some of the bunkers were inside Moscow, others were on its periphery, and some further away. The map attached to the Duff Mason report shows that they were planning to target bunkers on 3 sides of the city. This meant that, unless the wind was from due North, fallout from some of the peripheral strikes would drift downwind into the city.

³⁸ Duff-Mason rPart II Annex A para 8

³⁹ Letter from David Owen to Jim Callaghan, 19 December 1978, PM78/145

⁴⁰ Commentary para 22

Michael Quinlan has claimed that there was an ethical dimension to the change away from deliberately targeting cities:

“The central idea in such plans would be to inflict disabling damage upon the aggressor state as a state, so as to remove or emasculate its ability and disposition to persist as an evil force against others, while keeping as low as possible (appallingly grave though that would probably still be) the harm done to innocent civilians”⁴¹.

The reality, as they knew, was that the “great collateral damage” from attacking command bunkers could cause at least as many casualties and would result in far more long-term environmental damage.

*US Trident missiles with 100-kiloton warheads are not sufficiently accurate and powerful for a single warhead to produce a high probability of destroying a hardened installation. The calculations for Option 1 may have assumed that two Trident warheads would detonate in the vicinity of each of around 40 bunkers.*⁴²

Having come up with how many warheads would be delivered in each scenario, the Duff Mason report then considered the total number of warheads that would need to be deployed, and argued that this figure was substantially higher.

The Commentary says that there is a sharp drop in the number of warheads required if only targets not defended by the ABM system are attacked.⁴³ So Options 1 and 2 required significantly more deployed warheads than Options 3a and 3b.

A study carried out for the Thatcher Government in 1980 calculated that Option 1 would require 27 Trident C4 missiles, ie 216 warheads.⁴⁴ This study assumed that the Moscow ABM defences would be limited to 100 launchers. It considered a number of ways of reducing the number of warheads – using penetration aids, improving accuracy and targeting the ABM system. It concluded that none of these improvements, on their own, would lower the number of warheads required to less than the amount that could be carried on one submarine, 128. A second study was commissioned to consider whether this could be achieved if all these improvements were carried out simultaneously. The results of this second study are not known.

The Commentary on the Duff-Mason report suggests that it was not only Option 1 that required two submarines on patrol, but also Option 2.⁴⁵ The 1980 study argued that Option 2 could be carried out with one submarine, but was asked to substantiate this conclusion.⁴⁶ This suggests that the number of deployed warheads required for Option 2 was close to 128.

The Chiefs of Staff argued that Option 1 was essential and that this could only be fulfilled with two submarines on patrol. This would mean that 5 Trident submarines

⁴¹ Thinking about nuclear weapons, Michael Quinlan, RUSI Journal, December 1997.

⁴² Commentary para 21

⁴³ The Commentary notes that because Cruise Missiles were more accurate, fewer delivered warheads were required for a system based on Cruise than for one based on Trident. Commentary para 21

⁴⁴ Trident Progress (CSA’s Ad Hoc Nuclear Technical Policy Working Group), loose minute from Commodore VM Howard, 19 November 1980. DEFE 25-325 E57

⁴⁵ One submarine on patrol could only fulfil options 3a and 3b. Commentary

⁴⁶ *ibid*

were built rather than 4. The Navy had made similar arguments with regard to Polaris. They had tried to argue that there was a need to destroy 32 cities in the Soviet Union rather than 16, knowing that this would require a larger submarine fleet.

In 1982 the UK opted to purchase the more advanced Trident D5 missile. This meant that they would only require four new submarines. The UK initially insisted on being able to deploy 12 warheads on each missile.⁴⁷ This was probably based on their calculations for Option 1. A submarine with 12 warheads on each D5 missile would carry 196 warheads. This was close to the 216 warheads required for Option 1 with the less accurate C4 missile.

The drafting of the Commentary shows the significance of the ABM calculations in the warhead estimates. A proposed amendment from the Vice Chief of Naval Staff was rejected, with the following comment:

“VCNS’s rewording is trying to explain, in shorthand, a very complex calculation concerning Chevaline decoys, Polaris Re-entry bodies, MIRVs and ABM, which has led Duff-Mason to recommend a very large increase in warheads for the Successor after Chevaline”⁴⁸.

This suggests that the large increase in warhead numbers, proposed by Duff-Mason, was primarily due to estimates of the numbers needed to overcome the Moscow ABM system.

The full breakdown of Trident warhead numbers for each of the Duff-Mason Options has not been published. The table below is an estimate.⁴⁹

Option	Targets	Warheads delivered	Warheads deployed
1	Command centres in and around Moscow	70-90 ⁵⁰	216 ⁵¹
2	Breakdown of Moscow, Leningrad & 2 other cities	35-45 ⁵²	128 ⁵³
3a	Breakdown of Leningrad & 9 other cities	35-45	40-50
3b	Lesser damage on 30 big targets	30	33-37

The warhead requirement was progressively reduced as the Trident system was developed. The first three Vanguard class submarines deployed between 1994 and 1997 armed with 60 warheads each. The main reason for the reduction in the warhead

⁴⁷ The US negotiated with Russia to reduce the number of warheads on their D5 missiles to 8. The UK argued that they had to retain the right to put 12 warheads on their D5 missiles and so the missiles on British submarines were completely excluded from the treaty. PONI Interview Franklin Miller I 18 min 00 secs.

⁴⁸ Brief by D of DP(C) on VCNA amendments, DEFE 25-335 E100

⁴⁹ If irreparable damage was equivalent to 7 psi overpressure, then 22 100-kiloton warheads would be required for 40% irreparable damage to Moscow and 13 for Leningrad. Other cities may have required 3 or 4. These calculations were carried out by the author using the Lawrence Livermore National Laboratory programme Weapons Effects.

⁵⁰ The number of delivered warheads in Option 1 is around twice that of any other option. Commentary.

⁵¹ DEFE 25-325 E57

⁵² If irreparable damage was equivalent to 7 psi overpressure, then 22 100-kiloton warheads would be required for 40% irreparable damage to Moscow and 13 for Leningrad. Other cities may have required 3 or 4. These calculations were carried out by the author using the Lawrence Livermore National Laboratory programme Weapons Effects.

⁵³ DEFE 25-325 E57

numbers was that the Atomic Weapons Establishment (AWE) was unable to meet the original production schedule of 100 new warheads per year.

Following the Strategic Defence Review in July 1998 the number of warheads deployed was reduced to 48 per submarine. It is likely this and earlier reductions were partly based on the MoD reassessing the effectiveness of the Moscow ABM. The current deployment may be based on an assumption that this system is no longer fully operational.

Consideration of British Long Ranged Theatre Nuclear Forces

At the same time as discussions were taking place on replacing Polaris with Trident, separate consideration was being given to the need for NATO to have more Long Range Nuclear Forces. In 1979 Britain was considering not only being a host for US Ground Launched Cruise Missiles, but also whether to develop a British version. In this context Cruise was not an alternative to Trident, but an addition to it. This is revealed in papers published in the same archive file as the Duff-Mason report.⁵⁴

The US argued that NATO needed intermediate nuclear forces, between tactical and strategic forces. These were to provide a capability for controlled nuclear escalation. The jump from using nuclear weapons on the battlefield to a strategic nuclear exchange was considered to be too wide to be credible. Long Range Theatre Nuclear Forces (LRTNF) would provide an intermediate response. The proposed systems were Ground and Submarine-Launched Cruise Missiles and Pershing ballistic missiles.

Britain had a LRTNF capability in the form of V bombers assigned to NATO. But by 1979 these aircraft were approaching the end of the life. In considering whether Britain needed its own future LRTNF a number of arguments were presented which relate to the Polaris replacement decision and to the future of British nuclear weapons today.

A paper promoting this new force said:

“there are many things they could do to use which would be too severe for (say) a Tornado strike on Poland to be an adequate response but not severe enough for a Polaris strike on Moscow (brining annihilation upon us).”⁵⁵

Polaris was not considered to be appropriate for a limited nuclear strike. The association of Submarine-Launched Ballistic Missiles with a strategic exchange meant that they were unsuitable for more selective functions.⁵⁶ Firing one or two missiles would expose the submarine to strategic attack.

“the threat posed by the UK Polaris force of massive retaliation against cities is credible only in response to the threat of strikes of a comparable scale and nature. ... Use by the UK of this force in response to Warsaw Pact conventional or limited nuclear aggression which was unlikely to threaten immediately the continued existence of the UK, would be deterred by the threat of massive strategic retaliation by the Soviet Union against the UK.”⁵⁷

⁵⁴ DUS(P) paper on LRTNF 1979, DEFE 25-335 E69

⁵⁵ DUS(P) paper on LRTNF 1979, DEFE 25-335 E69 (0) page 1

⁵⁶ DEFE 25-335 Annex A page 6

⁵⁷ A study of a possible new UK contribution to a NATO Long Range Theatre Nuclear Force, Report by the Directors of Defence Policy, 1979, DEFE 25-335 E64 Annex A page 12f

The preferred British LRTNF option was US Ground-Launched Cruise Missiles armed with UK warheads. But the proposal for a new force ran into problems from the start. The Chief of Defence Staff was in favour of a modest replacement for the V bombers, but the heads of all three services were opposed to any new force.⁵⁸ The Naval staff argued that estimates of future warhead production at Aldermaston were exaggerated and it would not be possible to add an additional 100 warheads for LRTNF to the existing programme. The priority nuclear programmes at the time were Chevaline, a replacement for WE-177 and the successor to Polaris.

⁵⁸Chief of Defence Staff statement to the Defence Secretary on LRTNF, 1979, DEFE 25-335 E69(i) page 2f

NOTES

This approach was echoed in a key document written by the US Strategic Advisory Group in 1995. *Essentials of Post War Deterrence* recognised that it would be irrational for the US to use nuclear weapons in response to conceivable threats that it might face in the future. So it proposed that it would be helpful if it appeared that US decision-makers could lose their sense of reason -

“That the US may become irrational and vindictive if its vital interests are attacked should be part of the national persona we project to all adversaries”.⁵⁹

⁵⁹ *Essentials of Post War Deterrence*, Strategic Advisory Group, 1995, obtained under the FOIA by Hans Kristensen.