TRIDENT AND THE ALTERNATIVES

MODERNISING THE UNITED KINGDOM STRATEGIC NUCLEAR DETERRENT FORCE
FOREWORD

In 1980 the then Secretary of State for Defence published an Open Government Document (1) explaining the Government's decision to replace Polaris with the Trident system in the 1990s. In 1982 we published a further Open Government Document (2) explaining our decision in favour of the Trident II (D5) system. Since then our commitment to Trident D5 has remained an important part of the Government's defence policy and programme.

We are now well down the road towards introducing the system in the mid-1990s and excellent progress is being made. It is however sometimes claimed, by those who support the case for an independent British nuclear deterrent, that there are other systems which would be more appropriate and cost effective for Britain. This booklet explains why such arguments are misconceived. It should read in conjunction with the earlier Open Government Documents on Trident, which it is intended to complement.

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Ministry of Defence
January 1987

(1) Defence Open Government Document 80/23
(2) Defence Open Government Document 82/1

Defence Open Government Document 87/01
INTRODUCTION: THE TRIDENT FORCE

1. Each of the United Kingdom’s 4 TRIDENT ballistic missile firing submarines (SSBN) will be capable of carrying 16 TRIDENT D5 missiles. The missile’s range, depending on payload, will be between 4000 and 6000 nautical miles. According to published information the D5 missile will be able to carry up to 14 independently targetable (MIRV) warheads. The actual number of warheads which will be carried by the D5 in UK service is classified information; any figure which might appear in open debate can only be regarded as speculative. The Government has, however, indicated (1) that the UK will not use the full capacity of the Trident D5 missile and that each Trident submarine will carry no more than the number of warheads which would have been installed if the Trident C4 missile (8 warheads), which was the initial choice of missile for the force, had been procured.

2. In the 1990s, each Trident submarine will therefore carry no more than 128 warheads compared with Polaris boats which entered service in the 1960s each carrying 48 warheads. The number of Trident warheads will therefore be at most only 2½ times more than Polaris. This has to be seen against a 5-fold increase in Soviet strategic warheads since 1970. This enhanced capability is absolutely essential to ensure that Soviet defences, which were not in existence when Polaris entered service but are now deployed and are continuing to be strengthened, can be overcome and the credibility of the deterrent preserved. Trident will continue to represent a minimum deterrent when matched against Soviet capabilities, particularly since a four boat Trident force can guarantee only one submarine on patrol at all times.

(1) Defence Open Government Document 82/1, paragraphs 30 and 31
A CRUISE MISSILE DETERRENT

THE SUBMARINE LAUNCHED CRUISE MISSILE (SLCM) OPTION

3. The cruise missile flies at very low level and at sub-sonic speeds. The SLCM derived from the US TOMAHAWK missile flies at about 90-100 feet at 500 knots to a maximum range of 1600 nautical miles. By contrast, the published range of Polaris is 2500 nm and, as already noted, the published range of TRIDENT is between 4000 nm and 6000 nm depending on payload. The sea room afforded to the TRIDENT submarine – while still within range of the major targets in the USSR – includes virtually the whole of the Atlantic north of the equator. In contrast, a SLCM firing submarine (SSCN) would be limited to just a portion of the Norwegian Sea. British TRIDENT submarines will have approximately 15 times more sea room in which to conceal themselves than a SSCN. In addition the SLCM has to be fired within 500 miles of land or else it becomes inaccurate. This limits the ocean space available. And even this includes no allowance for detours or for other reasons.

NUMBER OF MISSILES

4. The unit cost of a cruise missile is very much less than that of Trident. This apparent cost advantage is, however, misleading. Cruise missiles can carry only one warhead; many more are therefore required to match the striking power of a single TRIDENT missile with several independently targetable warheads.

5. Furthermore, ballistic missile warheads are much less vulnerable than cruise missile warheads. Cruise missiles would have to face massive air defences, both surface to air missiles and fighters. Soviet air defences are rapidly being strengthened, with look-down shoot-down fighters designed to combat low flying aircraft and missiles, and a range of surface to air missiles capable of destroying cruise missiles supported by increasingly capable satellite, airborne and ground based sensor systems.
6. Air defences against cruise missiles are not limited by treaty. The probable rate of attrition of cruise missiles will be very much higher than that for ballistic missiles and is likely to rise still higher. This, too, adds significantly to the number of cruise missiles which would be required if Britain switched from a ballistic to a cruise deterrent. It has been argued that the high attrition rates of cruise missiles will in future be reduced by stealth technology. However it is unlikely that an operational version of a cruise missile, be it ALCM or SLCM, incorporating advanced stealth technology would be available for some time to come; furthermore the gains in terms of penetration resulting from the new technology cannot yet be fully assessed. It would therefore be most unwise to rest the procurement of the UK’s only strategic deterrent system on new technology which would not only be too late into service for our purposes but the effectiveness of which has still to be demonstrated, particularly against the background of further improvements in cruise missile defences.

7. Taking all these factors into account our assessment is that Britain would need at least 400 SLCMs at sea of the type currently available to provide an assured minimum deterrent equivalent to Trident as it will be deployed in the mid 1990s. In view of the rapid strides being made in Soviet air defences this estimate is, if anything, on the low side.

8. TRIDENT, when deployed, will have sufficient reserve capacity for further enhancement to maintain an effective minimum deterrent even if the Soviet Union should improve its anti-ballistic missile (ABM) defences further. The only means currently available of enhancing a SLCM system is to increase the numbers of SLCM cruise missiles which in turn increases the numbers of submarines required to carry them. This increases costs very substantially.
NUMBER OF SLCM FIRING SUBMARINES (SSCNs)

9. The total weapon carrying capability of the UK attack submarine (SSN) force is too small to deploy the required number of SLCMs even if they carried no other weapons. These submarines are, moreover, fully committed to the important task of seeking out and destroying other submarines and surface vessels which requires a very different deployment pattern and mode of operation than that demanded of a strategic deterrent force, which needs to avoid rather than look for contact with other vessels. Dedicated submarines would therefore be required to carry the UK's SLCMs. It is true that some US SSNs have been converted to carry SLCMs; however, these submarines are not tasked to provide their country's sole strategic deterrent. This role cannot be fulfilled by other than submarines devoted exclusively to this task.

10. The number of cruise missiles that could be installed in a converted SSBN was assessed before the TRIDENT decision in 1980. The figure which came out of these studies was that it would be theoretically possible to install 80 TOMAHAWK type SLCMs in a single SSON. The basis for this design assumption was that the centre section of the UK TRIDENT submarine would be reconfigured to carry SLCMs. Subsequent work in the United States has indicated that this figure is soundly based.

11. To achieve the deployment of the 400 SLCMs needed to match the deterrence effect of Trident would require a force of 5 SSCNs on patrol at all times, assuming 80 missiles per submarine. To maintain 5 SSCNs on patrol requires 8 in the operating cycle, and this, allowing for a 25% margin of missiles in maintenance, would involve the purchase of 800 SLCMs. In order to run a viable operating and refit cycle, a total force of 11 SSCNs would be needed to sustain five submarines on patrol.
OPERATIONAL ASPECTS

12. The recent progress made in Soviet anti-submarine warfare (ASW) technology makes the availability of adequate sea room, discussed in paragraph 3 even more vital.

13. To plan to deploy UK SSCNs carrying the nation's ultimate deterrent into waters which could be strongly contested by Soviet ASW forces, would be operationally very risky. Studies which have examined possible scenarios in an East/West conflict have foreseen the maritime confrontation taking place in the NE Atlantic and Norwegian Sea where UK SSCNs, because of the limited range of their cruise missiles, would have no alternative but to operate. The West's strategic forces must therefore deploy well away from Soviet bases, and use the largest possible tracts of ocean, thus forcing Soviet SSNs to conduct long transits through areas dominated by our own ASW forces and setting them a huge problem in trying to locate our strategic deterrent. The use of sea based cruise missiles would therefore undoubtedly reduce the operational effectiveness of the UK deterrent.

THE AIR LAUNCHED CRUISE MISSILE (ALCM) OPTION

14. The relatively poor in-flight survivability of current SLCMs compared with ballistic missiles is shared by the present generation of ALCMs. Equally large numbers, therefore, are likely to be required if the striking power of the UK's Trident missiles is to be matched.

15. More airfields and support facilities would be required to base the aircraft needed to launch the large number of ALCMs. The increased number of airfields would partly offset the major drawback of the vulnerability of aircraft on the ground by enabling them to be widely dispersed. Hardened aircraft shelters, too, could also help in this respect, but both would mean a very substantial investment in facilities and equipment.
16. Dependent upon the type of aircraft chosen to deliver the ALCMs, the large numbers of missiles required could be carried by aircraft already in service. However, this would prevent the use of these aircraft in the conventional role. A more acceptable solution would almost certainly involve the purchase of considerable numbers of dedicated nuclear delivery aircraft - an expensive proposition.

17. If a large aircraft were chosen as a delivery platform in order to reduce the overall numbers of aircraft required, it would be particularly vulnerable on the ground because of the difficulty of providing adequate shelters. Continuous airborne patrols could overcome this drawback but the mounting of such patrols would be prohibitively expensive both in terms of resources and manpower. Furthermore, to have RAF nuclear armed aircraft on permanent patrol in and around UK airspace would be unprecedented and inherently undesirable.

COSTS OF CRUISE MISSILES

18. To embark on a programme based on cruise missiles at this stage would be very much more expensive than Trident. The capital costs would include the extra submarine hulls or airborne delivery platforms and their associated systems, sunk costs, redesign costs, cancellation charges, the production cost of the larger number of warheads required and the additional sums for support (including additional airfields in the ALCM option), logistics and contingency margins. In addition there would be the cost of warhead redesign. It would not be possible to use the warhead designed for Trident in a cruise missile. The cost of developing a new one would be some hundreds of millions of pounds. Preliminary estimates show that the overall cost of a programme based on either the SLCM or ALCM option would amount to about double the £9.3 billion set aside for Trident. Running costs for the larger number of submarine hulls would be at least double and might involve providing a submarine operating and maintenance base in addition to Coulport and Faslane. There would clearly
also be considerable manpower and training implications with either cruise missile option.

**TIMESCALES**

19. Even if time could be saved by buying a suitable US cruise missile off the shelf, there would be substantial delays involved in converting the SSBN design into one suitable for cruise missiles. For ALCMs, either existing aircraft could be converted to carry the missiles at the expense of their conventional role, in which case new aircraft would be needed in considerable numbers to compensate; or new large aircraft could be purchased for the ALCM role. New and complex supporting facilities would be necessary in either case. None of this can be achieved quickly.

20. Either cruise missile solution, even if the missiles were bought off the shelf, would require several years for the design, development and production of a new warhead. (International treaty provisions preclude the acquisition of a warhead from another country). A switch to a cruise missile system would inevitably mean either the running on of an increasingly ineffective Polaris force after the mid 1990s or suffering a gap of several years in our strategic deterrent capability.
21. The United Kingdom has enjoyed a close and fruitful dialogue with the French Government on a wide range of defence and security matters, including some nuclear matters, and our policy is to continue and enhance that dialogue. The Government examined the possibility of replacing Polaris by a French missile. However, the only possible missile - the M5 - is only now about to begin development, whereas the Trident missile is already well down the development process. There must therefore be some doubt whether the M5 missile would be available to the UK on the same time-scale as Trident. More importantly, the switch to a different missile now would entail a substantial redesign of the submarine, associated systems and the missile warhead. This would inevitably lead to several year's delay in deployment of the replacement system.

22. Moreover, abandonment of the Trident programme in favour of another system would almost certainly carry considerable cost penalties. These would include loss of expenditure on the existing Trident project; the cost of redesign; and the cost of extra refits for existing Polaris SSBNs entailed by delay in deploying the successor system. Given these probable cost penalties and uncertainties about missile maintenance costs, purchase of the M5 has the potential to cost the UK considerably more than the procurement of Trident D5.

SUMMARY

23. The intrinsic characteristics of a cruise missile system make it less suitable than a ballistic system as the ultimate and only strategic deterrent for a medium size nuclear power. There is much evidence of sustained improvements in Soviet defences against cruise missiles used in the land attack role and for the current generation of cruise missiles the rate of attrition would be extremely high. To achieve the same striking power as Trident would therefore require a significantly larger number of sea based cruise missiles and submarines and would be twice as expensive in both capital and running costs. For similar
reasons, an air launched cruise missile solution is likely to cost about double that contemplated for Trident. Furthermore, too much delay and uncertainty would be involved in resting this key procurement decision on future hopes for stealth technology.

24. Of the French ballistic systems, only the M5 is a possible contender as an alternative to Trident. However, its adoption would entail considerable cost penalties.

25. The shorter range of alternative sea based systems compared with TRIDENT creates operational penalties; in particular, the reduced sea room available makes them potentially more vulnerable to Soviet anti-submarine operations.

26. Both the SLCM and M5 solution would require complex modification programmes to both launch platform and weapon, resulting in several years delay in the deterrent modernisation programme. Any alternative to Trident would almost certainly demand a new warhead design taking several years. The mid 1990s in-service date would not be met which would mean running on an increasingly ineffective Polaris force or suffering a gap in our deterrent capability.

CONCLUSION

27. TRIDENT still offers much the most cost effective option for meeting the UK's requirement for a minimum deterrent to succeed Polaris/Chevaline.