

Memorandum from the Ministry of Defence

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ANNEX

**RESPONSE TO HOUSE OF COMMONS DEFENCE COMMITTEE'S REQUEST FOR
FURTHER INFORMATION IN THE CLERK'S LETTER OF 17 JANUARY**

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**1. The Government's detailed assessment of the deterrent options,
including submarine-based cruise missiles**

We published a detailed assessment of the principal deterrent options that were considered, and the process involved, in Section 5 and Annex B of the White Paper. Clearly, this represented a high level summary of a great deal of work, much of which is necessarily highly classified. As the White Paper makes clear, options based on aircraft, land-based silos or surface ships are manifestly less capable, in some cases wholly impracticable and in all cases at least as expensive as continuing with submarines. As most commentators have agreed, the only credible alternatives for retaining a nuclear deterrent are options within a submarine solution. The Defence Secretary and his team will of course be happy to answer any detailed follow-up questions when he appears before the Committee on 6 February.

As for the option of cruise missiles launched from submarines, we are clear that, in both cost and capability terms, retaining the Trident D5 missile is by far the best approach. A comparison between cruise and ballistic missiles is set out in detail in Box 5-1 of the White Paper.

An option based on submarine-launched cruise missiles would, like the option we have decided on, require the procurement of new nuclear-powered submarines to fulfil the deterrent role, as the existing conventional role submarine flotilla, and the Astute class which will replace them, are required to undertake other key defence tasks. Indeed, given that a much larger number of cruise missiles, compared to Trident D5 missiles, would be required to meet our minimum deterrence requirements, moving to a deterrent based on submarine-launched cruise missiles could well lead to a requirement for additional submarine hulls.

Because of the costs and capability disadvantages of cruise missiles set out in the White Paper, we have not undertaken a detailed analysis of what the requirement for submarine hulls

would be.

It is also the case that moving to a submarine-based cruise missile solution would necessitate the procurement of new nuclear-capable cruise missiles and also the development of a new nuclear warhead suitable for use with a cruise missile, both at considerable cost and technical risk. Thus, such an option would have significant disadvantages in both cost and capability terms compared with the option we have chosen.

2. A full breakdown of the estimated costs of the whole deterrent programme, as proposed by the Government, including acquisition, support, infrastructure and service delivery costs, over the lifetime of the new SSBNs; and comparable costs for the other options

The White Paper provided the broad granularity of information on costs which is the most the Government believes it would be prudent to make public at this early stage. As the White Paper made clear, engagement with industry during the concept and assessment phases of the project will produce more refined cost estimates by the time we come to place a contract for the detailed design of the submarines.

The initial estimate of the range of likely costs is based on extensive work which drew on historic cost comparisons as well as analysis of the risks and uncertainties inherent in the costings. Inevitably, not all elements of the underlying detail will be accurate at this stage, and although we are confident that the overall range is of the right order, we will want to bear down on the through life costs to the maximum extent possible as the project matures. It is for these reasons, and to avoid compromising commercially sensitive information, that the Government does not propose to provide a more detailed breakdown of the estimated costs of the future deterrent programme at this stage.

We have already stated that the £15-20 billion acquisition cost estimate includes some £11-14 billion for the submarines, £2-3 billion for the possible refurbishment or replacement of the warhead and £2-3 billion for infrastructure. The submarine costs include provision for system concept and assessment, platform, propulsion plant and strategic weapon system development. The warhead costs are additional to the running costs and ongoing programme of investment in new facilities and manpower at the Atomic Weapons Establishment (AWE) Aldermaston. The infrastructure costs, likewise, are additional to provision for ongoing

maintenance of infrastructure, which is contained in our in-service cost estimates for the current deterrent and its replacement.

Turning to the options which were discarded in favour of a new generation of ballistic missile submarines, the White Paper made clear that the reasons for not selecting them were a mixture of cost and capability. In the case of the, significantly more expensive, silo and large aircraft options the acquisition costs were much higher than in the case of the submarine option, and represented a substantially larger share of the through life costs. The in service support costs were also higher. Both the acquisition and in-service costs for the surface ship option were of the same order as for the submarine option.

3. Clarification of the timing of the end of life for each of the Vanguard submarines, with or without a Service Life Extension Programme, explanation of how these dates were reached and which elements of the submarine are critical

The expected out-of-service dates for the four Vanguard-class submarines, with and without any life extension programme, are as follows:

	Commencement of Sea Trials/Reactor went critical	Out of Service Date (no life extension)	Out of Service date (with life extension)
HMS Vanguard	1992	2017	2022
HMS Victorious	1994	2019	2024
HMS Vigilant	1996	2021	2026
HMS Vengeance	1999	2024	2029

These dates are based on the date that the reactors on the four submarines first went critical, the original design life of the submarines (which was for a life of at least 25 years), and - based on our experience of operating the Vanguard-class submarines, experience with other classes of submarines, the results of discussions with our internal experts, and the views of industry - our assessment of the maximum additional in-service

life that we believe it is currently prudent to assume can be achieved through a life extension programme.

Some details on those components of the Vanguard-class submarines, which we believe are critical in terms of limiting the effective service life of the submarines, are set out at paragraph 1-3 of the recent White Paper. Life extension much beyond 5 years is likely to require replacement of some of the systems critical to submarine operations, such as external hydraulic systems, elements of the control systems (plane and rudder), sonar systems, electrical systems (including main battery) and refurbishment or replacement of elements of the nuclear propulsion system. This would involve some hull penetrations. Replacing these systems would require extended additional maintenance periods resulting in loss of boat availability and significant cost but would not enable significantly increased life. Extension to both component safety justifications and the whole reactor plant safety justification would also be required (and could not be assured). Other systems would need careful assessment and replacement of the turbo generators, secondary propulsion gear and assemblies, deterrent missile hydraulics, hatches and mechanisms, might be required. There would also be increasing risks with the reliability of other major systems, including potentially the main engine, gearbox shafting and propulsor, all of which could require replacement.

As was made clear in the White Paper, we do not at this stage completely rule out further life extension of the Vanguard-class. The key point is that on current evidence it is highly likely to represent poor value for money. Moreover, there is also serious concern as to whether it will be technically feasible. The position will be kept under review at each key stage of the programme to design and build the replacement submarines. But given the severe uncertainties associated with life extension beyond the 30 year point, it would be grossly irresponsible not to start concept and assessment work in time to ensure we can field replacement submarines when the Vanguard-class reaches the 30-year point.

In this context, we would like to reiterate two points to the Committee. First, we believe the most relevant comparison with the Vanguard class - in terms of likely in-service life - is our own classes of submarine and not the US Ohio-class, to which some commentators have referred. The Ohio-class submarines are different boats with different original design life and a different manufacture, refit and maintenance regime, as made clear in paragraph 1-4 of the White Paper. The Resolution class submarines, for example, were maintained in-service for from 25 to 28 years and experienced serious loss of availability and significantly increased maintenance costs towards the end of their

lives. We have no wish to repeat that experience.

Second, many commentators have contrasted the 17 years quoted in the White Paper to design build and commission a new class of SSBNs with the time between the decision to procure Trident in 1980 and HMS Vanguard's first patrol in 1994. This overlooks the point made clear in the White Paper that much of the concept and assessment work for the Vanguard-class submarines, the stages on which we are about to embark for the replacement SSBNs, was carried out in secret in the decade before the decision to procure Trident was taken in 1980. Again, we do not believe that it would have been responsible or acceptable to have followed a similar course on this occasion.

4. Details of the process and consultations which preceded the presentation of a paper to the Cabinet on the future of the deterrent

The then Defence Secretary described the process by which these decisions were to be taken in his evidence to the Committee on 1 November 2005. Officials have undertaken work to assess the range of security risks and challenges that we might face over the next 20 to 50 years. Based on that assessment, officials considered our future deterrence requirements and then considered how best these requirements could be met, looking at the full range of options and potential costs. Annex B of the White Paper describes this process in more detail. This work involved discussions with a number of different parties, including, on a confidential basis, with industry and with some of our allies. Those assessments, and their conclusions, were considered in detail by senior Ministers and by the full Cabinet prior to the Cabinet discussion and final publication of the White Paper on 4 December.

1 January 2007