

## **TRIDENT VALUE FOR MONEY REVIEW**

### **Note by the Ministry of Defence**

1. This review of existing nuclear deterrent policy and procurement plans was commissioned by the Cabinet Office in Julian Miller's letter of 4 June (at Annex A). The detailed consideration of the issues raised in the Cabinet Office letter can be found in the other annexes to this report, and are summarised in succeeding paragraphs.

2. The review's main conclusions are:

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b. We should therefore reduce the scale of the UK deterrent, from 48 ■ warheads per submarine on ■ Trident missiles to 40 ■ warheads ■. This would reduce our operationally available warhead requirement from 160 to 120 and, in due course, would allow a reduction in our overall stockpile ceiling from 225 to 180 warheads.

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d. The programme to produce a successor warhead should be delayed by 7 years. This would mean that no decision is required in this Parliament.

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g. ■ Some additional refurbishment of the Vanguard Class is therefore needed to bridge the gap.

h. The Trident Value For Money review and the related Submarine Enterprise Performance Programme have produced the following savings:

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### **Assumptions**

3. In line with Julian Miller's note to Jon Day of 4 June, we have assumed that the UK will retain an independent, credible, minimum nuclear deterrent with similar levels of national sovereignty as today; that it will be based on submarine-launched Trident D5 ballistic missile; with continuous at sea deterrent patrols; ■ Savings are against the financial profiles agreed with HM Treasury at the time of the 2006 White Paper – only a small proportion relates to activity funded in the MOD

forward programme, which assumes, in line with the December 2006 White Paper, that the additional investment required for the renewal of the deterrent will not come at the expense of the conventional capabilities our armed forces need.

#### Deterrence

4. [REDACTED]

#### **Policy issues: Scale - warhead numbers, missile (tube) numbers**

6. [REDACTED] the deterrent scale can be reduced from 48 [REDACTED] warheads per boat [REDACTED], to 40 [REDACTED] warheads [REDACTED], reducing our Operationally Available Warhead requirement from 160 to a total of 120. [REDACTED] they would also allow a reduction in our overall stockpile ceiling from 225 to 180 warheads.

[REDACTED]

#### **Atomic Weapon Establishment (AWE): Programme Direction and Efficiencies**

8. Programme Direction. The current warhead programme at AWE is predicated on keeping refurbishment and/or replacement options open ahead of a Ministerial decision in 2012. [REDACTED] This will mean that the first warhead production unit does not need to be delivered until [REDACTED]. It also means that a decision on the successor warhead will not be required in this Parliament, [REDACTED]

9. Efficiency. Phases 1-3 of AWE's Transformation Programme have completed, resulting in modest headcount reductions. [REDACTED]

#### **CASD: 3 vs 4 boat fleet**

[REDACTED]

#### **Procurement issues: Vanguard-class Life Extension and Successor SSBN design**

14. In 2006, it was assumed that the Vanguard-class SSBNs could have their life extended by 5 years, allowing the second boat to be decommissioned in 2024 rather than 2019 (to maintain CASD, the service entry date of the first Successor boat is aligned with the decommissioning date of the second Vanguard-class SSBN). [REDACTED]

15. The VFM Review was tasked to look at two specific design issues: propulsion [REDACTED]. It recommends that both issues are considered by the MOD Investment Approvals Board at "Initial

Gate" approval point in September/October before providing final advice to Ministers, rather than the NSC deciding now, but offers the following comments:

- a. There are three options for the propulsion plant that will be used in the successor SSBN: PWR 2 (used in the current Vanguard-class), PWR 2b (a development of PWR2 with improved safety) and PWR 3 (the safest design). In addition to improving levels of safety,

### **Commercial issues: value for money and profit margin**

16. The commercial landscape in the submarine sector is a tapestry of previous initiatives which now need to be modernised and aligned to place the incentive firmly on cost reduction, performance, sustainability and collaborative behaviour. This is being taken forward through the Submarine Enterprise Performance Programme (SEPP), which is the procurement strategy for the submarine sector as a whole. SEPP offers the best opportunity to drive down costs for HMG and there is the potential to save £879M over the next 10 years, through efficiencies across the entire sector (not just on Trident).

### **Infrastructure**

17. Infrastructure designed for nuclear work is required for the build, support and disposal of nuclear submarines and for the maintenance of the Nuclear Firing Chain, through which political control of the deterrent is exercised. Around relate to maintenance, operations and overheads and it is these costs that are the focus for cost reduction in the SEPP (ie included in the efficiencies above). In terms of capital investment, the successor SSBN programme assessed that £3bn would be required for new or upgraded MOD facilities and command and control networks. While much work is still required to scope the need for this infrastructure programme, no major investment requirements are required within the next 10 years (aside from the site at Raynesway): effort should instead focus on necessary maintenance and life extension of existing facilities.

### **Overall Financial Position**

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### Next Steps

20. Ministers will wish to consider the recommendations of the Value for Money Review and the timing of any announcement. In particular, the reduction in warheads will be seen – and welcomed - internationally as a very significant disarmament move. ■ Domestically, however, there is a strong expectation that the Government will make any announce on Trident ahead of or as part of the wider SDSR announcement in the Autumn.

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4 June 2010

### **TRIDENT: VALUE FOR MONEY REVIEW**

As you know, the government has decided that there should be a value for money review of the Trident programme. We need to put the necessary work in hand.

This review should assume that the current policy of maintaining the essential minimum deterrent remains unchanged. Against this background, it should examine the following issues:

- any scope to reduce costs through refurbishing and prolonging the life of the current submarines;
- whether to acquire 3 or 4 successor submarines; the balance of cost saving versus levels of risk to CASD;
- the choice between the PWR 2 or 3 reactor;
- the scope to reduce the number of missile tubes to fewer than 12;
- the minimum necessary number of nuclear warheads;
- scope to minimise future infrastructure costs;
- the level of spend required to maintain the minimum essential capability at AWE Aldermaston;

- the level of spend required to maintain the minimum essential capability at Raynesway;

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This analysis will need to plug in to the SDSR. It will be important that the Cabinet Office and Treasury keep very close to your work. An initial report should come to us in four weeks time.

Copies of this letter go to Gus O'Donnell, Peter Ricketts, Bill Jeffrey, Robert Hannigan, James Quinault, Richard Freer ██████████

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**JULIAN MILLER**

## SUCCESSOR SSBN PROPULSION: PWR 2 OR PWR 3?

### Summary

- The options for the propulsion system that will be used in the successor SSBN are derived from two different designs of reactor plant; [REDACTED]PWR2) and [REDACTED]PWR3). Each represents varying degrees of safety, performance, cost and life but through life cost and permissibility are key to selection.
- The views of the Naval Reactor Plant Authorisee (NRPA) and the Defence Nuclear Safety Regulator (DNSR) on whether potential designs meet the Department's obligations in respect of Health and Safety legislation are needed to determine the permissibility of the plant through life.

### Other Benefits

6. PWR3 offers further benefits over PWR2, although these have not been factored into our plant selection analysis directly as they are either intangible or can be mitigated through alternate measures.





7 July 2010

## **NUCLEAR SUBMARINE INFRASTRUCTURE - SCOPE TO MINIMISE FUTURE COSTS**

### **Introduction – Costs and their Treatment**

1. This paper discusses the scope to minimise nuclear submarine infrastructure future costs. Infrastructure designed for nuclear work is required for the build, support, and disposal of nuclear submarines, to meet the demonstrable safety requirements of the HSE Nuclear Department and the MOD's own regulator, and is in the ownership of the MOD, Rolls Royce, Babcock Marine and BAES Submarines. Site owners are required to meet the requirements of the Nuclear Installations Act; they obtain a licence to operate, and maintain the facilities in a proper condition under the terms of that licence, subject to periodic review<sup>1</sup>. This paper analyses the planned costs in the period 2010 to 2025 in detail, and 2025 to 2040 in outline. Costs fall into two groups, recapitalisation and running costs [REDACTED]

2. **Recapitalisation.** Approximately 90% by value of the necessary facilities at Barrow, Devonport and Clyde (Faslane) have been recapitalised during the last 20 years. Remaining infrastructure works include the Core Production Capability at Raynesway, Derby, which is the subject of a separate value for money workstream. These modern facilities have a nominal service life of 40 years and planned life extension, rather than replacement, is the way forward. In parallel, a requirement for future submarines to fit in existing infrastructure, and a strategy of rationalisation, decommissioning and disposal will minimise the footprint, redevelopment of existing facilities and need for future investment.

[REDACTED]

5. **Running Costs.** The approximate [REDACTED] of nuclear infrastructure costs relate to maintenance, operations and overheads. The full cost breakdown is at Annex A, and it is clear that MOD effort to improve efficiency should be focused in this area.

[REDACTED]

### **Ownership and Management**

10. At Devonport, a large proportion of the estate is owned and managed by Babcock Marine in comparison to the Clyde naval base where the estate is MOD owned but managed by Babcock. Devonport is one of only two facilities in the UK (the other is HM Naval Base Clyde) that can maintain SSBNs & SSNs. Devonport provides the only current facilities that are capable of refuelling and defuelling SSBNs and SSNs. These facilities will be required for the foreseeable future in order to maintain and refit submarines. Therefore, Devonport will remain the deep maintenance base for the SSN and SSBN programmes.

11. The total nuclear infrastructure programme is not yet managed on a programme wide, through life basis. DSM has established a Facility Group Leader (FGL) post within the submarine operating centre to take control of the programme and optimise it. [REDACTED]

### **CURRENT INITIATIVES AND OPPORTUNITIES**

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<sup>1</sup> MOD fulfils the analogous requirements of the MOD regulator.

12. Within the MoD there are a number of ongoing initiatives that will deliver cost savings and these are detailed within Annex C. These initiatives will eventually be replaced by others as opportunities for further savings are identified. Detailed below are examples of where the initiatives impacts on infrastructure.

#### **Initiatives focused on Maintenance, Operations and Overheads**



#### **Minimisation of new facilities requirement - Future Deterrent design**


14. The Future Deterrent programme aims to minimise investment in new facilities by working within the constraints of the existing facilities' design and safety case. A study undertaken to scope the infrastructure constraints has been provided to the Platform design team as a key requirement to be met.




#### **FUTURE POTENTIAL OPPORTUNITIES**

16. The scope to reduce infrastructure costs by rationalisation of the sites at Barrow, Clyde and Devonport is limited, as each site offers a unique capability that is not easily replicated. Many of the infrastructure requirements will remain extant as they are driven by the on-going need to provide Continuous at Sea Deterrence .

17. Notwithstanding that, there remain a number of opportunities to reduce infrastructure costs beyond those rationalisations already programmed. Past challenges on infrastructure costs have concentrated on facility acquisition cost, rather than running cost. Research has shown that running costs dominate, and efficiency initiatives should focus in that area going forward. The use of SEPP as the vehicle for foundation contracts which address specifically running costs, and the creation of a dedicated intelligent customer (FGL) for nuclear facilities across the programme, creates an opportunity to realise significant economies and efficiency for SEPP. The history of nuclear facility acquisition includes several examples where risk, cost and schedule have been inadequately controlled, and the ability of the MOD to reverse this situation and deliver benefits is greatly improved by the creation of the Facility Group within DSM.

18. In addition, several infrastructure development or change opportunities have been identified in the course of developing the Facility Group Through Life Management Plan. Examples of these are detailed at Annex D 

#### **CONCLUSIONS**

19. The opportunities to reduce submarine infrastructure future costs are concentrated in the costs associated with operating the facilities and the overheads associated with them. The infrastructure base for the submarine programme has been largely recapitalised in the last twenty years, and major recapitalisation is not required for the Successor submarine. 

20. The design of the Successor submarine will not of itself drive investment in shore facilities, since its footprint, and the missile handling arrangements, are identical to those currently in place for Vanguard.



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## **CURRENT INITIATIVES AND OPPORTUNITIES**

### **Initiatives focused on Maintenance, Operations and Overheads:**

#### **Maritime Change Programme (MCP)**

1. The Maritime Change Programme is to deliver a programme of changes as a result of the Naval Base Review. The set of initiatives that come under the MCP are:

#### **Terms of Business Agreement (TOBA)**

2. The TOBAs are characterised by a legally binding long term Partnering agreement between the MOD and Key Industrial partners and incorporates the following features:

- guaranteed reductions in the cost base;
- transformation and continuous improvement;
- supporting collaborative working;
- strategic rationalisation; and
- open book access to financial information.

3. The Babcock Marine TOBA was signed in March 2010 and overarches all work with Babcock (Faslane, Devonport and Rosyth). Through this deal, Babcock are guaranteeing more than £1.2Bn<sup>2</sup> cost savings [REDACTED]

#### **Security Defence and Security Review (SDSR) Study 9.4- Underwater environment**

4. The main proposition is that by concentrating on a long term, optimised submarine programme, the overall resources required for build, maintenance and support across the three Tier 1 suppliers<sup>3</sup> can be smoothed, and suppliers are encouraged to share resources (for example a common enterprise test organisation the covers build and overhaul) and drive efficiency into the business. Development of a new commercial construct for the Submarine Enterprise, that strengthens the core roles of each of the Tier 1 suppliers, while encouraging collaboration on products and services [REDACTED]

#### **The Flotilla Output Management (FOM) initiative**

5. This is being led by DISM and Babcock Marine and includes an 'Infrastructure Workstream' that will endeavour to optimise in-service support at HMNB Devonport, Devonport Dockyard and HMNB Clyde. Over the next six months, a number of options to deliver the optimum fit of nuclear infrastructure will be identified. The work will also ascertain if there any 'quick wins' for reducing Nuclear infrastructure costs. There is also the FOM 'Safety Coherency' workstream which will examine how the outputs from the Shutdown Safety Case can be used to drive efficiencies at the two

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<sup>2</sup> There is no guarantee that the costs will go down in absolute or real terms.

<sup>3</sup> Rolls-Royce Submarines, BAE Submarines and Babcock Marine.

Naval Bases. The output from both of these work-streams will feed into the wider FOM Business Change/Transformation Programme.

### **Devonport Efficiency Initiatives**



#### **Training**

15. Clyde has been designated by the Maritime Change Programme as the Submarine Centre of Specialisation. The programme will require delivery of new training facilities and additional accommodation. The Submarine Training Programme Support Board (TPSB) will provide a more coherent programme approach to future SM training developments. This will provide a robust structure for requirements capture and setting, integration of new capabilities into existing training and the through life upkeep of the training solution. TPSB continues to identify opportunities for greater integration which will ultimately optimise the training infrastructure footprint.



#### **Cessation of Refuelling**

22. With changing the refuelling regime to a Fuelled for Life there are facilities that become less utilised. For example, the Low Level Refuelling Facility (LLRF) at Devonport should only be required at the end of the Future Deterrent Programme. Consideration will be made to whether life extension work should be reduced or if the plant can be mothballed until required.



**TRIDENT VALUE FOR MONEY – C4 INFRASTRUCTURE**

1. The 2006 White Paper makes allowance for the development of new or replacement infrastructure to support the overall deterrent capability. A substantial element of this infrastructure is associated with Command, Control, Communications and Computers (C4), which encompasses the Nuclear Firing Chain (NFC) through which political control of the deterrent is exercised





## **ATOMIC WEAPON ESTABLISHMENT (AWE): INVESTMENT & EFFICIENCIES**

### **Issue**

1. This paper presents an analysis of the minimum spend required at AWE as part of the wider Trident Value for Money Review.

### **Recommendation**

2. To note that:  
[REDACTED]

### **Background**

3. We have taken account of the very extensive work already completed or underway on many aspects of the warhead programme. These include the recent Nuclear Warhead Capability Sustainment Programme (NWCSP) 2010 review, Future Warhead Options work, AWE ML's own Transformation Programme, commercial work on AWE Management Options, business cases for NWCSP facility projects and previous Planning Round option work.

### **Programme Context**

4. The NWCSP is the current approval under which the majority of the UK nuclear weapon programme at AWE is funded. It arose following a wide ranging review of the UK's Nuclear Warhead capability commissioned by the MOD's Chief Scientific Adviser (CSA) in 2002.  
[REDACTED]

### **Analysis**

7. In order to test the possibility of making significant cost savings, we analysed the AWE programme by running five high-level policy options:

- **Option 1** – Assume deferral of the successor warhead programme [REDACTED]
- **Option 2** - Reduce the number of Operationally Available Warheads (OAW) in accordance with the separate Trident VFM Scale analysis<sup>1</sup>. This assumes a reduction from the current 160 OAW to 120 OAW.
- **Option 3** - Further efficiencies from the AWE ML Transformation programme.
- **Option 4** [REDACTED]
- **Option 5** [REDACTED]

Detailed analysis of each option is set out in the attached Appendices.  
[REDACTED]

12. Options 1-5 do introduce some additional risks, but these are generally offset by the ability to optimise to a clear programme timeline. [REDACTED]

### **Further work**

13. We have also considered other proposals where savings may be achievable but where the associated risks and constraints are not sufficiently understood to make a sound judgement at this

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<sup>1</sup> Annex C to the Trident VFM Report

stage. We recommend that further work on these areas is continued or initiated to inform programme management within the MOD post-SDSR. The details are at Appendix 6 and in summary are:

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*Appendix 1*

**Option 1: Defer the decision for transition to a new warhead**

1. The baseline programme is predicated on keeping options (refurbishment and/or replacement) open ahead of a decision in early 2012. ■
3. **Risks.** A key benefit of this Option is to reduce the risk associated with developing a successor warhead ■
4. **Costs.** The major cost changes associated with this options are:
  - a. A deferral of costs contained within the White Paper £2-3Bn for replacement or refurbishment of the warhead, ■
6. **Wider benefits.** The strategy has the potential to generate wider benefits, which help offset inherent risks driven by affordability. ■
7. Investment in the NWCSP (particularly in hydrodynamic, high explosive and assembly/disassembly facilities) will need to continue ■

*Appendix 2*

**Option 2: Reduce the number of warheads within the current stockpile.**

1. Based on the potential policy change proposed under another strand of the Trident VFM work, we have examined the savings from reducing the number of OAW, where the overall programme has been deferred as described in Option 1. Key assumptions are:
  - a. The number of OAW is reduced from 160 warheads to 120 warheads, based on a reduction to 40 for each boat;
  - b. The overall stockpile ceiling reduces from no more than 225 to no more than 180 warheads

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*Appendix 3*

**Option 3: Further efficiencies in the ongoing running of AWE**

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*Appendix 4*

**Option 4:**

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*Appendix 5*

**Option 5:**

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**FURTHER WORK OUTWITH THIS VFM REVIEW**



