

SECRET (1)



Prime Minister.

See minute from Lord Corfield and  
Policy Unit (attached).

Subject to colleagues, agree Harpoon?

MO 26/3

PRIME MINISTER

A. & C. 94.

SURFACE-TO-SURFACE GUIDED WEAPONS FOR THE ROYAL NAVY

A 1

In my minute of 1st September 1983 I informed you and our OD colleagues of my intention to authorise the procurement of the McDonnell Douglas Harpoon missile system as the second generation surface-to-surface guided weapon to be fitted to the Royal Navy's four Batch III Type 22 Frigates and the first eight Type 23 Frigates. Procurement action was subsequently postponed because one of the other contenders, British Aerospace, submitted a revised proposal in respect of the Ship Launched Sea Eagle missile system. This proposal was analysed in detail and, in addition, I asked Peter Levene to carry out an independent validation of my Department's appraisal of the competing systems. I then directed that best and final offers be sought from all four tenderers. Those offers have now been received and scrutinised in detail.

2. My original decision to buy Harpoon was based on its superiority on operational grounds over other missiles, the absence of development risk, its availability for the Type 22 Frigates and its cost. None of these factors have been changed by the retendering exercise. It remains the case that Sea Eagle would require further development to meet the same standard and our doubts about its ability to meet the Type 22 timescale have deepened. I attach at Annex A an updated and expanded version of the Annex to my Minute of 1st September 1983, which sets out the issues in more detail and which will be of particular interest to those of our colleagues who have not seen the previous version.

3. On cost, after allowing for additional development costs, evaluation firings and in-service trials, and contingencies, Sea Eagle would cost



£271.6M for 215 missiles as against £221.6M for the same number of Harpoon (at \$1.41 to the pound; January 1984 prices, VAT inclusive). However, since the Harpoon missile is identical with the Sub-Harpoon, which is already in service in substantial numbers with the Royal Navy, fewer spares and in-service trials would be necessary. In addition surplus Harpoon missiles become available as older SSNs leave service in the 1990s. Taken together these factors allow us to meet our requirement with 60 fewer missiles, giving a reduction in the prime cost of the Harpoon programme to £180.8M (a breakdown of these cost estimates is attached at Annex B). If Harpoon is bought direct from MDAC 30% of the cost will be paid in sterling. An investment appraisal has shown that the differential in net present value terms is £75.5M.

4. In addition, the case for Harpoon was supported by the excellent offset proposal from McDonnell Douglas which would have ensured that employment opportunities in British Industry arising from a purchase of Harpoon would at least have equalled those resulting from a purchase of Sea Eagle. McDonnell Douglas have now improved this offer from 100% of the cost of the purchase to 130% of which half would be in areas of high technology and 30% on the Harpoon programme itself. McDonnell Douglas' record on offset is good and they are prepared to incorporate their undertaking in the contract.

5. Finally, I am concerned that failure to recognise Harpoon as the clear winner of the competition will undermine the credibility of such international procurement competitions and thereby reduce the willingness of foreign companies to participate. It may also affect our ability to sell equipment overseas, particularly to the US.

6. I intend, therefore, to proceed with my plans to procure Harpoon. We will no doubt face an adverse reaction both from British Aerospace and from their Parliamentary supporters. We will, however, be able to point to the excellent, and improved, offset terms from McDonnell Douglas in response to any criticism



that job opportunities in UK industry will be reduced. We may also be charged with reducing the overseas sales potential not only of Ship Launched Sea Eagle, but also of the Air Launched version which is under development for the Royal Navy and the Royal Air Force. While there would inevitably be some substance in such a charge, I do not believe that the immediate sales prospects of Air Launched Sea Eagle are likely to be seriously damaged by a decision against Ship Launched Sea Eagle, and I am not convinced that the sales potential of the Ship Launched version is as great as British Aerospace have claimed, given that it will be entering a highly competitive market dominated by well established systems and taking political and security constraints into account.

7. The tenders on offer expire on 11th April and I should like to make a public announcement by then, having first informed the firms concerned and my French and Italian counterparts. I should, therefore, be glad to know, as soon as possible that you and our OD colleagues are content with my decision to procure Harpoon.

8. I am sending copies of this Minute to our OD colleagues and to Sir Robert Armstrong.

*M. G. G.*

*[ Draft approved by the Secretary of State ]*

Ministry of Defence

2nd April 1984



SECOND GENERATION SURFACE-TO-SURFACE GUIDED WEAPON FOR TYPE 23  
AND TYPE 22 BATCH III FRIGATES

BACKGROUND

The immediate warship building programme for the RN consists of four Type 22 Batch III and subsequently eight Type 23 frigates. These ships require a Surface-to-Surface Guided Weapon (SSGW) to provide defence against the growing number of Soviet ships with an anti-ship capability. The aspects of most operational significance are range, salvo size, the ability to penetrate enemy defences, and the need to meet the tight In-Service Dates of the Frigate programme.

2. Our existing SSGW system is the Exocet MM38. To meet our future needs, a more advanced system is required and, as several are available, an international competition has been held to select the most cost-effective equipment. Six solutions were offered:-

- a. HARPOON - McDonnell Douglas Astronautics Company
- b. SEA EAGLE - British Aerospace plc
- c. OTOMAT (FR) - Matra SA
- d. OTOMAT (IT) - OTO Melara
- e. OTOMAT (UK) - Melara/MSDS
- f. EXOCET MM40 - SNIAS

The options at c and d were not evaluated in detail for reasons of cost and performance when compared to option e.

EVALUATION

3. An in-depth evaluation of the four remaining options against a



number of key aspects was conducted by MOD staff. The options were evaluated both as offered by the firms and on the basis of improvements thought necessary to meet the RN's requirement. In the latter case, account was also taken of the USN's plans to improve the existing HARPOON missile before the end of the decade.

4. Operational Factors. This evaluation resulted in the identification of the following main points:-

a. Range. The MM40 missile could not provide the 140 km range now required by the RN and, because it has a solid fuel motor, improvements would be impracticable. HARPOON and OTOMAT (UK) have the required range and ship launched SEA EAGLE [SEA EAGLE(SL) ] could be improved to provide it.

b. Salvo-Size. A Salvo of 4 missiles is needed to penetrate sophisticated defences; thus 8 missiles provide a 2-target capability. Eight missiles of all types can be fitted in the Type 23, and 8 HARPOON, MM40 and Sea Eagle in the Type 22 Batch III. Ship fitting constraints make it impossible to fit more than 6 of the longer OTOMAT(UK) missiles, as currently configured, in the Type 22 Batch III frigates.

c. Penetration against Countermeasures. Harpoon and MM40 both provide good performance against the postulated electronic countermeasures threat and possess the maximum survivability against hard kill weapons available now deployed and likely to come into service. SEA EAGLE (SL) and Oto Mat (UK) would both require considerable development of the associated MSDS target seeker and some improvements in missile performance to counter hard kill weapons.

d. Timescale. Harpoon and MM40 have no difficulty in meeting the timescale for the Type 22 Batch III vessels. The seeker improvements required for Oto Mat and SEA EAGLE could be ready in time for the Type 23 only, though British Aerospace have undertaken to retrofit the advanced seeker to earlier missiles



at no extra cost. The ship system for SEA EAGLE would almost certainly be late for the Type 22 Batch III ships. To meet the shipbuilding programme it would be necessary to fit an alternative weapon to these ships with the corresponding penalties in cost and further diversification of RN anti-ship missile types.

e. Numbers. If Sea Eagle, MM40 or Otomat were selected, the total number of missiles required would be 215 (including reserves, repair and distribution margins, firing allowances and evaluation rounds). However, the Harpoon missile is identical with Sub-Harpoon, already in service with the Royal Navy's SSNs and planned for SSKs. Because of this commonality it is possible to reduce the spares and repair and distribution margin for Harpoon and, since surplus SSN missiles will become available after 1996/7, to reduce the number of operational Harpoon missiles required. The total saving is 60, resulting in a requirement of only 155 missiles if Harpoon is selected.

5. In summary, from an operational point of view, Harpoon is a clear first choice, SEA EAGLE (SL) and OTOMAT (UK) could provide a similar capability at additional cost, and SEA EAGLE (SL) would probably not be available in time for the Type 22 Batch III ships.

6. Technology Factors. Anti-ship guided weapons is a field where international competition is particularly fierce. The production of the air launched SEA EAGLE missile provides within the UK the basic technology to enable air-launched anti-ship missiles and their supporting equipment to be designed and developed in the UK. The high technology area of 2nd generation missiles is the seeker head: but given the decision to buy ALARM the technological and industrial position on future seekers has essentially been protected. However, just as it was the Department's decision not to establish a technology base in the UK for first-generation SSGW technology, and the selection of Harpoon (if endorsed) will mean that a similar decision will have been taken with regard to second-generation technology, so the Department have no intention of acquiring third-generation SSGW technology. The latter would need to start now and could cost £100M in development over 10 years; the Department have no funds available



and consider that this is too high a premium to pay for the development of the appropriate technology in the UK.

7. It has been suggested that, if SEA EAGLE (SL) were selected, some development funds would be saved in future if the RAF were to select an advanced homing head for their Air-Launched Sea Eagles. There is however currently no such RAF requirement, and no funds have been set aside in the RAF's future programme. The hypothetical saving of part of these funds can therefore not be taken into account in assessing the cost to the Department of the Sea Eagle offer.

8. Industrial and Employment Implications

a. SEA EAGLE. Based on information supplied by BAe it is estimated that some 5,500 man years of work could be created by the selection of SEA EAGLE improved to meet the RN requirement. BAe, MSDS, Ames Industry, ROF Patricroft and IMI Summerfield would be the principal beneficiaries.

b. HARPOON. A MDAC offer to offset to the value of 130% will be included in the final contractual agreement between MOD and MDAC. This will generate at least a similar number of jobs to SEA EAGLE; half the offset would be in "high technology" areas and 30% would be directly concerned with the UK Harpoon programme. MDAC's record on SUB-HARPOON has been good and there is every expectation that this level of offset will be achieved. Lucas, Babcock Power, Ferranti and ROF Patricroft are likely to obtain a significant amount of work.

c. OTOMAT(UK). OTO Melara have offered offset at 100% of the contractual price. MSDS would expect up to 1600 man years work associated with the seeker, as well as being invited to tender for electronic units (1800 man years), and launch containers, propulsion unit shells and fuel tanks (180 man years). Plessey could expect some ship system equipment and ROF Patricroft warhead production.



d. EXOCET MM40. Offset valued at 70% has been offered by SNIAS. The exact location is uncertain but SNIAS have offered to have the seeker produced in the UK by either Ferranti or MSDS. This could amount to 1150 man years work.

9. Reassessment and Re-tendering Exercise. Following receipt of the original tenders, British Aerospace submitted a revised proposal in respect of Sea Eagle. This proposal was scrutinised in detail and, in addition, an independent reassessment of the Department's original evaluation of the contending systems was carried out by the Secretary of State's Personal Adviser. He endorsed the Department's original conclusions but advised that best and final offers be sought from all four tenderers.

These offers have been subjected to detailed scrutiny. None of the conclusions set out in paragraphs 3-7 above have been changed by the re-tendering exercise. On technical and operational grounds the choice of Harpoon has been reaffirmed.

10. Costs and Financial Provision. The cost of the various options at January 1984 exchange rates (£1 = \$1.41 = FF12.10) are:

Harpoon (155 missiles) - £180.8M; Harpoon (215 missiles) - £221.6M  
Otomat - £242.2M; Exocet MM40 - £248.1M; Sea Eagle - £271.6M.

Harpoon has the cheapest prime cost, and investment appraisal shows it also to be the cheapest option in discounted terms (by some £76M over Sea Eagle). If Harpoon is bought directly from the company McDonnell Douglas have agreed that 30% of the cost can be paid in sterling thus reducing the impact of future change in exchange rates.

11. Sales. Taking into account political/security constraints, sales of ship-launched Sea Eagle might reach £30M per annum although this must be considered an optimistic estimate given that it would be competing in a highly competitive market against well-established in-service systems. British Aerospace's current offer for the supply





of Sea Eagle to the Royal Navy is contingent upon the Department agreeing to waive all R&D levies upon overseas sales; there is thus no financial benefit to the Department from overseas sales of the system. Current potential sales of Air Launched Sea Eagle are not thought to be seriously endangered by an RN decision against SEA EAGLE (SL).

#### DISCUSSION

12. With regard to both its operational capabilities and its cost advantage, HARPOON is the clear first choice to meet the RN's requirement for a second generation SSGW system for the 4 Type 22 Batch III ships and 8 Type 23 ships. The main disadvantage of the EXOCET MM40 system is a lack of range. The capability of SEA EAGLE (SL) could be improved, but it is the most expensive solution. In any case, even the basic option would probably not be available in time to meet the Type 22, Batch III ships. OTOMAT(UK) suffers from many of the drawbacks of SEA EAGLE, and with SEA EAGLE(AL), Harpoon and EXOCET MM38 already in service it would lead to a further proliferation of types.

13. A choice of HARPOON would not have adverse implications for the technology base given that ALARM has been chosen to meet ASR 1228, neither would it adversely affect total employment opportunities. A decision not to procure HARPOON could adversely affect the UK's credibility as an organiser of international competitions as part of the procurement process, as well as affect the UK's ability to sell equipment to the USA.

14. To overcome the timescale problems with SEA EAGLE it would be possible to fit EXOCET MM40 to the Type 22, Batch III ships (to provide a degree of commonality with the existing fleet) and introduce SEA EAGLE on the Type 23s, but this would also entail a substantial cost premium. The only other viable option to keep the purchase within Europe would be to purchase Oto Mat, with its attractive offset package, and to accept the cost premium and the

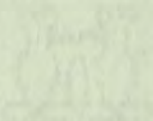


disadvantages of introducing a fourth surface-to-surface missile variant with our forces.

CONCLUSION

15. The operational and financial arguments lead to the conclusion that the most cost-effective option for an SSGW to equip 8 Type 23 and the 4 Type 22, Batch III Frigates is to purchase HARPOON at an estimated cost of £180.8M (January 1984 prices and exchange rates, VAT inclusive). This would cover 12 ship systems and 155 missiles together with associated shore based equipment and support.

CONQUEROR





BREAKDOWN OF COST ESTIMATES FOR HARPOON AND SEA EAGLE

(£M, January 1984 economic conditions)

	<u>HARPOON</u> (215 missiles)	<u>HARPOON</u> (155 missiles)	<u>SEA EAGLE</u> (215 missiles)
1. Tendered equipment	140.3	109.5	169.8
2. Improvements and non-tendered costs	29.6	28.9	40.9
3. Contingency	9.6	8.5	25.4
TOTAL (VAT exclusive)	179.5	146.9	236.1
4. VAT	27.0	22.0	35.5
5. Exchange rate variations	15.1	11.9	-
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TOTAL (at January 1984 prices and exchange rate of £1 = \$1.41)	221.6	180.8	271.6

Notes:

1. "Improvements and non-tendered costs" includes additions necessary to bring equipment into service, extramural and intramural support, and improvements common to all options. The larger sum estimated as necessary for Sea Eagle includes the provision of Government-funded equipments and facilities requested by BAe, the provision of telemetry kits and simulators (omitted from BAe's tender), and work required to improve and assure the reliability of Sea Eagle arising from inadequate guarantees of reliability contained in the BAe offer.

2. The contingencies on the programmes have been set at 5% for Harpoon and 12½% for Sea Eagle. Harpoon is a well-established programme with few areas of risk; Sea Eagle contains substantial areas of development risk and uncertainty, and contractual negotiations with BAe have made it clear that BAe are unwilling to bear this risk themselves. Since the risk would be left with HMG, appropriate provision must be made.

3. The original calculations were performed at the LTC 84 exchange rate of £1 = \$1.53. The exchange rate variations quoted in line 5 above take account of the actual January 1984 exchange rate, which was £1 - \$1.41.



4. The Harpoon figures include an R&D levy of £5.0M. A waiver of this levy is being sought from the US Government.

CONQUEROR

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Deference pronouncement A2

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