



A cc/RS 1A

MO 26/7

CHIEF SECRETARYA DEFENCE SUPPRESSION WEAPON FOR THE RAF

We need to take an important decision on how best to meet a major part of the RAF's operational requirement for Defence Suppression (DS) weapons. I attach a paper which sets out the relevant considerations.

2. The choice to be made is between two missiles, HARM and ALARM, both of which are basically acceptable to the RAF on operational grounds. HARM is a US missile which can confidently be expected to be available sooner (the US government has taken, but not announced, a decision on launching full production) and which will be significantly cheaper, at a total estimated cost for 750 missiles of £235M as against £388M for ALARM (VAT inclusive at August 82 prices). These figures however do not tell the full story. The extra cost of ALARM is largely attributable to the need to meet the sizeable research and development costs inherent in projects of this degree of technological complexity. Consequently for any extra orders, the relative differential moves in favour of ALARM. Moreover a purchase of HARM might oblige us in due course to pay additional costs for an updated capability to meet developments in the threat.

3. ALARM is a UK missile (to be produced by British Aerospace Dynamics Group in conjunction with MSDS, Thorn-EMI and others), which is judged to have greater potential to deal with expected developments in Warsaw Pact air defences. Equally important, it affords a key opportunity for us to maintain and develop our homing head and guided missile technological base, which is essential to us on defence grounds and which also enjoys a considerable international reputation.



4. I have decided to buy ALARM. In my judgement it is vital to retain our indigenous homing and guidance expertise. The extra cost of ALARM is justifiable for this reason, given that alternative means of sustaining the technology will be both expensive and less satisfactory. The employment offered in the UK and the stretch potential of the missile itself for the future also favour ALARM.

5. Unless I hear from you to the contrary before then, I propose to announce my decision next Monday, 16th May, by means of a low-key press statement.

6. As the paper indicates, a decision against HARM is likely to produce adverse reaction in the US, unless the decision is very carefully presented. I am arranging for our people in Washington to be suitably briefed in advance of an announcement of the decision.

7. I am copying this minute to the Prime Minister, all other OD colleagues, Patrick Jenkin and Sir Robert Armstrong.

*M. J. S.*

Ministry of Defence  
10th May 1983

A DEFENCE SUPPRESSION WEAPON FOR THE RAF

Note by the Secretary of State for Defence

---

Introduction

1. The principal roles of the RAF in the Central Region are offensive counter air against Warsaw Pact airfields and the interdiction of Warsaw Pact (WP) reinforcement and front-line forces. For these roles the RAF already possesses powerful forces in the Tornado GR1, in service now, and which from 1985 will be equipped with the airfield attack weapon JP 233. Studies have consistently shown that attrition levels will increase dramatically as the WP deploys the latest types of surface-to-air missiles (SAM) and their associated radars to protect airfields and concentrations of forces. The RAF has responded to this threat by ultra low level flying tactics, combined with the introduction of both passive and active ECM. However, the latest studies predict that, these measures notwithstanding, attrition rates will at least double between 1985 and 1990 without destructive Defence Suppression (DS) weapons. The RAF is therefore convinced that this rapidly growing threat to Tornado must be countered urgently by the acquisition of an anti-radiation missile (ARM) with earliest possible in-service date (ISD).

/2.

2. Following some preliminary studies it was decided to give industry the opportunity to be involved in saying how the requirement should be met; it was hoped at the same time that this process would provide an adequate basis for cost effectiveness comparison and hence bid selection. Both British Aerospace and Texas Instruments were asked whether they were prepared to accept the unusual feature, compared with more normal Government competitive bidding, of being invited to offer whatever solution they thought best instead of being asked for directly comparable proposals which aimed to meet a common specification written by MOD. They were warned, and formally accepted, that bid selection would be more open to the exercise of customer judgement of which system was preferred. We received three proposals:-

- (a) HARM FMS: Procurement of the High Speed ARM (HARM) from the US Government on Foreign Military Sales (FMS) terms, with some supporting work by Texas Instruments (TI), the contractor;
  
- (b) HARM COPRODUCTION: Procurement of HARM in which an element of final development and a substantial part of production would be carried out in the UK by Lucas and its sub-contractors, under the overall direction of TI, with certain key components such as the seeker-head and fuze being supplied on a government-to-government basis;
  
- (c) ALARM: Procurement of the Air Launched ARM (ALARM) from BAeDG and its sub-contractors, including MSDS (seeker and guidance) and Thorn-EMI (fuze).

Discussion

3. These proposals have now been evaluated in detail. This has not been a simple task: it has not yielded a straightforward solution. However the following key points have been established:-

- (a) Technical Aspects: HARM and ALARM are both technically capable of operating in the radar scenario envisaged for the 1980s, but ALARM promises to be better able to operate in the more demanding scenario postulated for the 1990s: in its present form HARM lacks stretch potential.
- (b) Operational Aspects: HARM and ALARM both afford an acceptable basic DS capability although both proposals as bid suffer operational deficiencies; in the case of ALARM, the Air Staff regard these as serious and requiring correction. An allowance for this purpose has been included, therefore, in the costs presented at (g) below.
- (c) The Programme: HARM is offered with an In-Service Date (ISD) of September 1986, ALARM with an ISD of August 1987. The US Government has now taken (but not announced) a decision on launching HARM full production, whereas ALARM has yet to be fully developed, and we judge that there is a /much

much greater risk of programme slippage than with HARM. ALARM as offered would have a faster maximum production rate than HARM so that if 750 missiles were purchased (the minimum essential buy on operational grounds), ALARM deliveries would be complete by September 1989 whereas HARM deliveries would not end until January 1991 - but only if BAeDG could adhere to the timescale of their programme.

(d) Technology Base: If HARM FMS were purchased, there would be no technology transfer to the UK; HARM COPRODUCTION would bring little work of technological benefit to the UK. ALARM is the only current proposal which would provide sufficient work to maintain MSDS' highly regarded homing head expertise necessary for future applications to other missile systems, not only of the DS type. ALARM also offers valuable work on guidance systems to BAeDG, gives Thorn-EMI an opportunity to develop laser fuzing, and provides the UK rocket motor industry with one of two much needed opportunities for new development work, the other being at risk to the outcome of work-sharing on a collaborative project.

(e) Employment and Sales: HARM FMS provides no UK employment; HARM COPRODUCTION would generate some 3500 project man-years over 8 years mainly

/at Lucas

at Lucas and the ROFs (mostly on production), and more (perhaps as much as another 5000) if Lucas were then selected (but this is by no means guaranteed) to participate in the HARM programme for the US or for sales to third countries. ALARM would require some 9400 project man-years over 7 years mainly at BAeDG, MSDS and Thorn-EMI. Some additional 6000 man-years would be generated if ALARM overseas sales reached the 1250 missiles which we regard as a realistic upper limit. BAeDG hope to sell substantially more than this.

- (f) US Attitude: Our decision on HARM/ALARM will receive close attention in the Congress and in the Administration, whose attitudes are critical if we are to maintain our sales of weapon systems and components to the US Services. Since 1975, our sales have doubled in real value, and the adverse trade imbalance has halved, to 1.5:1; but there is currently £1000M worth of business to be settled. We have pressed the DOD and Congress to give UK companies the same fair deal as US companies get here, and to avoid protectionist and restrictionist measures. A decision against a US system, HARM, which is available earlier, is cheaper and operationally acceptable could well expose us to similar criticism, even although we can rightly say we warned firms, and they accepted, that this was not a normal competition and the outcome would

/be more

be more than usually subject to customer judgement.

- (g) Costs: The cost of the options, for different numbers of missiles, is shown at Annex A, Table 1. Table 2 shows the cost and cash flow for a purchase of 750 missiles. For a purchase of this size, there is a premium of some £19M (8%) for buying HARM COPRODUCTION but of some £153M (65%) for buying ALARM. On a discounted cash flow basis as indicated at Annex B, the premiums are £17.1M (8%) and £141.7M (70%) respectively. The price quotations received from the firms are all valid until the end of May. Under standard Foreign Military Sales (FMS) terms, the entire HARM FMS price and the FMS element of the HARM COPRODUCTION price (50% of the total price in the case of a buy of 750 missiles) are determined by the price the US government pays, which in turn depends on any engineering changes they may require, and on the size of their order, and any economies secured in the US programme. This has yet to be decided. The ALARM bid is Fixed Price and we have Fixed Price bids to cover all except one of the changes in the specification which the RAF regard as essential and for which provision has been made in the cost estimates at Annex A.



4. We therefore face a difficult choice. On the one hand, HARM will we believe enter service significantly earlier than ALARM: this is a major advantage and one to which the Air Staff attach very great importance because of the need to give Tornado GR 1 the maximum available protection from the earliest possible date against WP defences whose effectiveness is considerable, and improving rapidly. HARM is also preferred on operational grounds by the Air Staff. Moreover, for a buy of 750 missiles, the present HARM price (either FMS or COPRODUCTION) is very considerably cheaper than ALARM.

5. On the other hand, ALARM because of its more advanced technology promises to be generally more effective than the existing version of HARM against the more potent and complex air defence systems and tactics the WP is expected to deploy in the 1990s. Moreover, the ALARM programme would sustain workload at BAeDG, provide significant development work for Thorn-EMI and in the UK rocket motor industry, and make a critical contribution to maintaining the only UK indigenous radar homing head capabilities at MSDS, where the only major existing assured development work is on Sea Eagle, and that is reducing. It is also important that the field of anti-radar homing, like electronic counter measures (ECM) technology, is one in which it is essential to possess the fullest possible technical understanding (which only indigenous development and production affords) of the equipment we use in order that in the event of war it can be employed, adapted, and modified to achieve maximum operational and tactical effect.

6. It is necessary also to address the longer term implications of either choice. Selection of HARM would leave within present allocations funds available for development of future options to meet any advanced threats that may emerge. Relevant here is a proposal for a Short Range Anti-Radiation Missile (SRARM) shortly to be considered under NATO Feasibility Studies, and early national work on this project could put the UK in a strong (but not certain) position to get the NATO missile head with significant benefits to the UK technology base. However, neither work on this project, nor a technology demonstrator programme (nor some combination of the two) is considered sufficient for the maintenance of our indigenous homing head and guidance capability. Development work on a specific project is needed for this. Selection of ALARM, while absorbing the entire AFD budget currently allocated to DS projects overall, would provide an assured future for our indigenous capability as well as providing the RAF with a weapon of high performance and with stretch potential.

Conclusions

7. The choice between HARM and ALARM depends on the weight to be placed on cost and ISD on the one hand and long term potential and technology base considerations on the other. We conclude that on balance the arguments favour ALARM, as offering extra capability in the 1990s, meeting concern about the industrial base, particularly the indigenous homing head and guidance technology, and guaranteeing the ability to react swiftly in war to enemy countermeasures; the extra cost of ALARM is regarded as acceptable to secure these benefits.

TABLE 1: COMPARATIVE COST OF OPTIONS FOR VARIOUS NUMBERS OF MISSILES

£M

No. of Missiles	500	750	1000	1500	2000
HARM FMS	179.1	234.8	291.8	388.1	482.6
HARM CO-PROD.	200.3	253.8	308.9	409.3	510.3
ALARM	349.4	387.9	426.3	503.1	579.9

TABLE 2: COMPARATIVE COST OF OPTIONS FOR 750 MISSILES

	83/84 £M	84/85 £M	85/86 £M	86/87 £M	87/88 £M	REMAIN- ING YRS £M	10 YR TOTAL £M
HARM FMS	26	23	41	41	52	52	235
HARM CO-PRODUCTION	27	24	34	35	41	93	254
ALARM	47	84	98	91	50	18	388
DRAFT LTC 83 (excludes IM)	8	15	21	44	66	82	236

NOTE: Costs are estimated total costs in £M @ Aug 82, VAT incl, excluding sunk costs and running costs. The Tables are reproduced from DEP 5/83 and OR 7/83 respectively. Exchange rate of £1 = 1 dollar 59c.