



de Sir R. 16bs

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PRIME MINISTERNIMROD AEW

1. In your minute of 28 February, you asked me to prepare an account of what has gone wrong with the Nimrod airborne early warning (AEW) project during our term of office. The following report and the annexed chronological history of the project to date have been prepared in consultation with the Treasury, the Department of Trade and Industry and the Law Officers' Department.

2. We have of course frequently acknowledged in the House that this project is one of which neither Government nor industry can be proud and it is only right that we should seek to draw appropriate lessons from our experiences with the project.

3. Although you asked specifically about the handling of the project during our term of office - and the following report concentrates on this period - most of the difficulties and





delays which have beset the project have their origins in the way the project was begun in 1977. With hindsight it is apparent that, driven by a perceived need to replace our Shackleton AEW aircraft in 1984, the project was authorised after a limited feasibility study and a project definition stage which was inadequate by the criteria adopted by my Department following the Downey Report of 1966; the technology involved had not been demonstrated; the timescale, involving the overlap of development and production, was over-ambitious and allowed no margin for unforeseen difficulties or delays, despite the high-risk, technologically ambitious nature of the project. With support from both sides of the House, the Ministry of Defence was, in essence, accepting the assurances of contractors that they could meet a technological challenge which was in some ways greater than that presented by the development of the Boeing AWACS system - for example, the Nimrod airframe is only half the size of the Boeing and this made it necessary to automate certain facilities which are operated manually in the AWACS - and could do so in half the time and at a considerably lower projected cost. In this connexion, it is <sup>astounding</sup> interesting to read the claims in the letter at Annex B from Arnold Weinstock, addressed to the Prime Minister of the day six weeks before the decision was announced. When, more than seven years later, GEC Avionics produced incentive price proposals to complete the development, it became apparent that they had seriously underestimated the scale of the task.





4. The essential lessons to be learned from the Nimrod AEW experience are that in future complex national development projects of this type:

- a. we should ensure that project definition continues until the technology involved has been demonstrated and the full development contract can be based on a clear specification with agreed acceptance criteria to establish that the specification has been satisfactorily met;
- b. until that stage has been reached and confidence established, we should move ahead by comparatively short steps defined as closely as possible;
- c. we should establish contractual terms which, by providing for these shorter steps, bring the contractor under effective discipline;
- d. we should appoint a single prime contractor and, as a natural corollary,
- e. we should have a single project manager in the Ministry of Defence with full control over specialist activities and heading an integrated technical, financial and contracts team.





and the country

5. These lessons have been costly for the Department to learn. I attach the utmost importance to ensuring that they are applied to projects in future. For example, in the present case a single AEW Project Director has already been appointed on the lines of sub-paragraph 4e.

6. There may be other, subsidiary lessons, for example, I shall be considering with the Chief of Defence Procurement whether our project managers should spend longer in their appointments.

7. You asked me to cover a number of specific points: I do so in the following paragraphs.

#### The original contracts

8. Separate contracts were placed in April 1977 with what is now British Aerospace (BAe) for the development and production work on the Nimrod airframe and in August 1977 with what is now GEC Avionics (GAv) for the development and production of the mission system avionics (MSA). It is the latter work that proved the most technically challenging part of the project and the source of continuing delay. It included the radar, complex data handling, electronic support measures and the communications system.





9. Following the receipt of a costed programme prepared by GAV, the MSA development work was contracted for on a cost-plus percentage fee basis. A cost-plus approach was the only one feasible at the outset when it was impossible to define in detail the requirements of the specification: the contract was framed on the basis that the work would proceed "in collaboration with the Ministry of Defence".

10. Ever since the original contract was placed, the Ministry of Defence has been at liberty to terminate it. Under the terms of the contract, our liability to GAV in the event of termination would be strictly limited: it would not extend to compensation for loss of profit on the uncompleted work. The Treasury Solicitor advised early in 1985 that, given the terms of the contract and the periodic review and authorisation of the work by the Ministry under it, and in the absence of any evidence indicating misrepresentation or fraud on the part of the company, it was not possible for the Ministry for its part to claim for any relief.

11. Thus the absence of a contractual "remedy" has its origin in the initial cost-plus approach. As the annexed chronology records, discussions aimed at moving from a cost-plus to a definitive programme with contractual performance incentives were opened with GAV following an intervention by Geoffrey Pattie as Minister of State for Defence Procurement in October





1983. Our decision in OD on 12 February 1986 at last enabled us to bring those chequered discussions to a satisfactory interim conclusion.

#### Project management and monitoring arrangements

12. From the outset in 1977, there was a Project Director with overall responsibility for the Nimrod AEW programme. (There were four incumbents of this post from the inception of the project.) Within that overall responsibility, he delegated financial and technical authority for the development and production of the MSA to the 'specialist' director who managed the majority of the Department's airborne electronics equipments. (There have been four incumbents of this post with MSA responsibilities since 1977.) Similar delegations of authority were made for the procurement of a simulator, the development and production of IFF (Identification, Friend or Foe) and cryptographic equipment, and engine modifications. Technical and financial authority for the air vehicle element of the Nimrod AEW programme was held by the Project Director himself.

13. From the beginning, Quarterly Project Review Board Meetings were held separately with each of the main contractors. Joint meetings also took place each quarter. Contractors were required to submit a comprehensive quarterly financial report to





specialist directors and a Quarterly Financial Review of the project was also held. In addition, in accordance with management practice in the Ministry, Controller Aircraft (CA) himself reviewed the project on a quarterly basis and copies of the papers were sent to HM Treasury and the Department of [Trade and] Industry. The Nimrod AEW project was also, in common with other projects, subject to my Department's committee procedures, in accordance with which the project was re-submitted for review in 1979, in 1983 and twice in 1985.

Revelation of existence of major problems

14. The chronology shows that early slippages and the consequent cost increase in the Nimrod AEW programme were in the main caused by industrial action and manpower shortages. It was in 1981-82 that major technical problems in the MSA programme became apparent, with further slippage and significant cost increases. The company's top management were left at this time in no doubt about my Department's dissatisfaction with their poor progress and our consequent loss of confidence in their forecasts of cost and timescale for completion of what had been recognised at the outset as an extremely ambitious technical undertaking. At our insistence, GAV <sup>who is CAU</sup> undertook urgently to review their programme to take better account of remaining risks and uncertainties. The review resulted in a revised overall AEW project plan which was accepted as offering the most practical

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route to recovery. Notable factors were extra support to the flight development programme, improvements to the company's management and - in addition to normal management information arrangements - reports made every six weeks to CA until the end of 1983 which closely monitored progress against significant milestones. At the beginning of 1983, CA also called for weekly reports from the Project Office on the status of the project as a whole; the frequency was subsequently changed to once a fortnight, and these reports have continued to be made on that basis until this month. The further delays and difficulties with the MSA programme which these arrangements revealed led to the Ministerial intervention by Geoffrey Pattie mentioned in paragraph 11.

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Ministerial involvement

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15. The Nimrod AEW project was first considered by Ministers of this Government when we came into office in 1979. By then the estimated cost at 1985-86 average outturn prices had risen from £856M to £1027M, the date for delivery of the first aircraft for Training Release had slipped from May to December 1982, and the date for introduction to service from April to November 1984. However, at this time, there was little difference between the estimated further expenditure needed on the Nimrod and the cost of procuring the Boeing E3A (AWACS) aircraft. The then Defence Secretary (Francis Pym) took the view - with the agreement of





the present Foreign and Commonwealth Secretary, then Chancellor of the Exchequer - that the balance of advantage lay in continuing with the project.

16. In May 1980 the Controller Aircraft reported to the Minister of State for Defence (Euan Strathcona) a slippage of a further three months in the Training Release date as a result of the effects of the 1979 national engineering strike. Euan Strathcona came to the view that this did not warrant re-exploration of the AWACS alternative.

17. In April 1983 the project was submitted to the Minister of State for Defence Procurement (Geoffrey Pattie) for approval for its continuation following the review under my Department's committee procedures referred to at the end of paragraph 13. This report drew attention to the further slippages and the major problems outlined in paragraph 14. By that time the revised programme had been in place for some eight months, and GAV's progress against agreed cardinal milestones had been judged satisfactory. As a result of this renewed confidence that the revised programme timescales could be met, Geoffrey Pattie approved the continuation of the project.

18. This confidence proved misplaced, however: in the succeeding six months, further delays and difficulties in the MSA programme were reported, and as a result Geoffrey Pattie

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visited GAV in October 1983. He made clear to the firm his profound concern at the state of both the Nimrod AEW and the Tornado airborne intercept (AI) radar projects and told them that progress payments in respect of the former would be withheld until deliveries met the requirements of the contract. He wrote to Lord Weinstock on 8 November 1983 telling him that he would reconsider the matter when the company had made "get well" proposals. Payments were resumed in April 1984 after GAV had undertaken to submit incentive price proposals - which would have superseded the cost-plus percentage fee basis of the original contract - for the work then in hand on the MSA. (Some £2M accordingly remained withheld until a risk-sharing basis was agreed with GAV following last month's decision.)

19. At the end of 1984, following officials' evaluation of GAV's proposals and further negotiations, my predecessor (Michael Heseltine) reached the view that the aim should be to terminate the existing development contract with GAV at the earliest possible moment, although this was recognised to be some months away. His objective was to achieve a technically viable level from which to institute, wherever feasible, incentive contracts and competition for the remainder of the programme. By July 1985, the Department had carried out a technical audit and identified a technically viable level of capability - the Minimum Initial Operational Capability (MIOC) - which, though well short of the requirement as laid down in ASR

*Dismissed with whom?*





400, could be accepted by the Defence Staffs as an initial standard at which the aircraft could enter service. GAV's first response to this was very disappointing in terms of operational capability, timescale, risk and cost. Only vigorous and robust negotiation enabled us to agree with them the risk-sharing proposals endorsed by OD last month.

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### Specifications

20. It is important to distinguish between the Air Staff Requirement for an AEW system (ASR 400) and the specification for the Nimrod AEW system. The first is a military statement of need, the second a description of that need expressed in technical terms and agreed with the company. Since its issue in 1977, there has only been one change in the Requirement - the addition in 1983 of in-flight refuelling. This change did not affect GAV or the MSA.

21. The 1977 contract for the MSA referred to an outline specification which, because the precise course of the complex and technically demanding development programme could not be adequately charted, was accepted by all parties as requiring amplification.





22. Management Committees, on which the companies sat, were set up to manage this process of fleshing-out the outline. Both the detailing of the specification and the associated programme changes were managed within this framework and decisions were reached by mutual agreement. This work had been largely completed by the time we took office in 1979 and re-endorsed the programme (the current issue of the contract specification is dated February 1981). I am satisfied, however, that during this early period of refinement neither the Department nor the company was in any respect seeking to change the intention behind what was, inevitably, as explained above, only an outline initial specification.

23. In fact, only one change was made to the initial MSA specification: the radar frequencies specified would have caused interference on the French television network and it was necessary to authorise the adoption of new frequencies. This was done in 1981 and necessitated a significant change in the design of the radar.

*Did the new frequencies cause new unforeseen problems. Was the choice as effective as*

24. During 1985, GAv realised that some of their radar performance problems stemmed from the fact that echoes from moving vehicles were overloading the radar system and preventing it from operating satisfactorily when the Nimrod aircraft was within 120 miles from the coast. As a consequence, in order to meet the requirement stated in the outline specification for the

*Surely this was only to be expected*





detection of targets over water right up to a populated coastline, GAV will have to develop a 'ground moving target' filter. This device formed part of a proposal the company put to us in 1978 for the development of a modification which could give full overland performance. This proposal was not then proceeded with - primarily because, although the Staff Requirement makes clear that the system should be usable over largely undeveloped areas of land such as the Northern Flank of NATO, it did not have to be usable over populated areas. The performance deficiencies in the radar which have given rise to the need for a filter now could allow my Department to be

*Did the dept know it? down in 652?*

misrepresented as having changed the specification in this respect. As this explanation makes clear, that is not the case. - *NO*  
 Indeed, GEC have on a number of occasions represented publicly that the Ministry of Defence changed the specification of the project and that this caused them great difficulty. The above paragraphs show that this generalised complaint is not true.

*? or correctly represented?*

*This amount does not show that - Quite the reverse.*

Changes negotiated in the original contracts

25. Numerous amendments to the original contracts have been negotiated over the years - over 100 in respect of the air vehicle and over 140 on the MSA contract. Apart from the changes related to in-flight refuelling (paragraph 20), radar frequencies (paragraph 23), and an increase in the power of a generator which drives avionics equipment, these were chiefly





concerned with increasing the contractual Limitation of Liability as the development work progressed. None of them prejudiced the contractors' ability to meet the specification.

26. I am sending copies of this minute to the Chancellor of the Exchequer, the Secretary of State for Trade and Industry and the Attorney General; and to Sir Robert Armstrong.

*J. Brennan  
(Private Secretary)*

*[ Approved by the Defence Secretary  
and signed in his absence ]*

Ministry of Defence

26th March 1986