NATIONAL AUDIT OFFICE

Report by the
Comptroller and Auditor General

Ministry of Defence

Major Projects Report 1997

HC 695 Session 1997-98
13 May 1998

This report has been prepared under Section 6 of the National Audit Act 1983 for presentation to the House of Commons in accordance with Section 9 of the Act.

John Bourn
Comptroller and Auditor General

National Audit Office
16 April 1998

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Part 1 : Introduction

Purpose and status of the Report

1.1 The Ministry of Defence (the Department) submitted the 1997 Major Projects Report to the Committee of Public Accounts in March 1998. The Major Projects Report, which reports the position at 31 March 1997, is intended to advise Parliament of the progress and costs of major defence equipment projects by comparing current estimated costs and in-Service dates with approved budgets and timescales. The current format of the Major Projects Report, where data on projects are presented in 25 project summary sheets, was endorsed by the Committee of Public Accounts in 1993, and the Major Projects Report 1993 was the first to follow the new format. The 25 project summary sheets for the 1997 Report are reproduced at Appendix 1 with a fold-out glossary of projects at Appendix 2 which explains what the projects are, what they do and spells out any acronyms used. Contractual and procurement terms which have been used in the report are explained in a further glossary at Appendix 3. Facts and figures which are commercially sensitive or confidential and cannot be disclosed have been starred in Appendix 1 and in the National Audit Office Report. Disclosure of these facts and figures could undermine the Department's negotiating stance, or give away intelligence. The National Audit Office have provided the Committee with a separate memorandum covering these areas of the report.

1.2 Projects are included in the Major Projects Report if they are in the top 25 projects in terms of forecast expenditure over the next 10 years and if at least £10 million had been spent by 31 March 1997. Five projects which were included in the 1996 Major Projects Report (C&AG's Report, HC238 of Session 1997-98) no longer qualify for the 1997 Major Projects Report. These have been replaced with five new projects as summarised in Figure 1.

Project changes in the 1997 Major Projects Report

Figure 1

Projects In	Projects Out
Sonar 2087	Trident
Active Decoy Round - Outfit DLH	Bridging for the 90s
Attack Helicopter	Sea Harrier Attrition Buy
Tomahawk Land Attack Missile	Infra-Red Counter Measures
Replacement Maritime Patrol Aircraft	Rapier Field Standard C

Source : National Audit Office analysis

Projects new to the 1997 Major Projects Report

1.3 **Sonar 2087** is a combined passive/active towed array sonar, to be retro-fitted to the Royal Navy's Type 23 Class frigates. The Feasibility Study phase was completed in October 1996, and approval was given to enter Project Definition in April 1997. The project is a result of the cancellation and merger of two previous sonar projects, sonars 2057 and 2080. The rationale for, and consequences of, the decision to combine the two projects is examined further in the box following paragraph 2.23. There has been no cost growth on the project, although the in-Service date has slipped by four months.

1.4 **Active Decoy Round - Outfit DLH** is a conversion of the existing Seagnat ship control system enabling it to fire an active decoy round which seeks and seduces anti-ship missiles. Following the completion of a competitive Project Definition phase, a Development and Initial Production contract was placed with GEC Marconi as prime contractor. During their validation exercise the National Audit Office examined the terms of this contract and noted that the Development element is firm price and the Initial Production element is subject to a fixed price with a Variation of Price clause. The findings of the National Audit Office examination are at Paragraphs 2.7-2.9. There has been cost growth of £2 million on the project and the current in-Service date is 27 months later than that originally approved because of Departmental funding constraints.

1.5 Following a competition a prime contract was placed with GKN-Westland Helicopters Ltd. for the supply of 67 WAH-64 Apache helicopters to meet the Army's requirement for an **Attack Helicopter**. The WAH-64 Apache is a variant of the US Army AH-64D Apache Longbow attack helicopter, and will be equipped with the Longbow millimetric Fire Control Radar, carry Hellfire anti-armour missiles, CRV-7 ground suppression rockets and be powered by the Rolls Royce Turbomeca RTM322 engine. A number of other equipments, such as an air-to-air missile, have yet to be selected. There has been an overall cost reduction of £42 million relative to original estimates. The project has a currently projected in-Service date of December 2000. The preferred in-Service date stated at the time of first approval of the project was December 1997. This date reflected the Department's view that a later date would entail an increasing shortfall in capability. Although the guidance agreed between the National Audit Office and the Department for the completion of project summary sheets states that the in-Service date at first approval should be taken as the baseline, the Department do not consider, in the case of WAH-64 Apache, that this represents a proper baseline against which to measure progress, and have reported a baseline in-Service date of December 1999 in the project summary sheet. This date was the

estimated in-Service date at the time that GKN Westland Helicopters Ltd. was selected as prime contractor, and was dependent on a contract being let by October 1995. The National Audit Office have used the earlier baseline in their analysis in the Report.

1.6 The **Tomahawk Land Attack Missile (TLAM)** is a conventionally armed land attack missile capable of launch from submarines. The project involves the purchase of missiles and modifications to the Ship Submersible Nuclear Tactical Weapons System to enable Royal Navy submarines to handle and fire the missiles. There has been a £7 million cost reduction against original estimates, and the project is predicted to meet its originally planned in-Service date.

1.7 The result of an international competition for a **Replacement Maritime Patrol Aircraft** was announced in July 1996 with British Aerospace's Nimrod 2000 selected as the preferred option. A fixed price contract was placed in December 1996 for supply of 21 mission equipped aircraft, a training system and initial logistic support. The project involves relifing existing Nimrod aircraft fuselages, fitting new wings and engines and fitting an entirely new mission system. There has been an increase of £37 million in the currently estimated cost of the project compared with original estimates, and the in-Service date is estimated as April 2003, 28 months later than when the project was first approved. The originally planned in-Service date was determined by expected equipment obsolescence. However, April 2003 was the earliest date offered by industry. There has been no slippage since the contract was let.

Cost

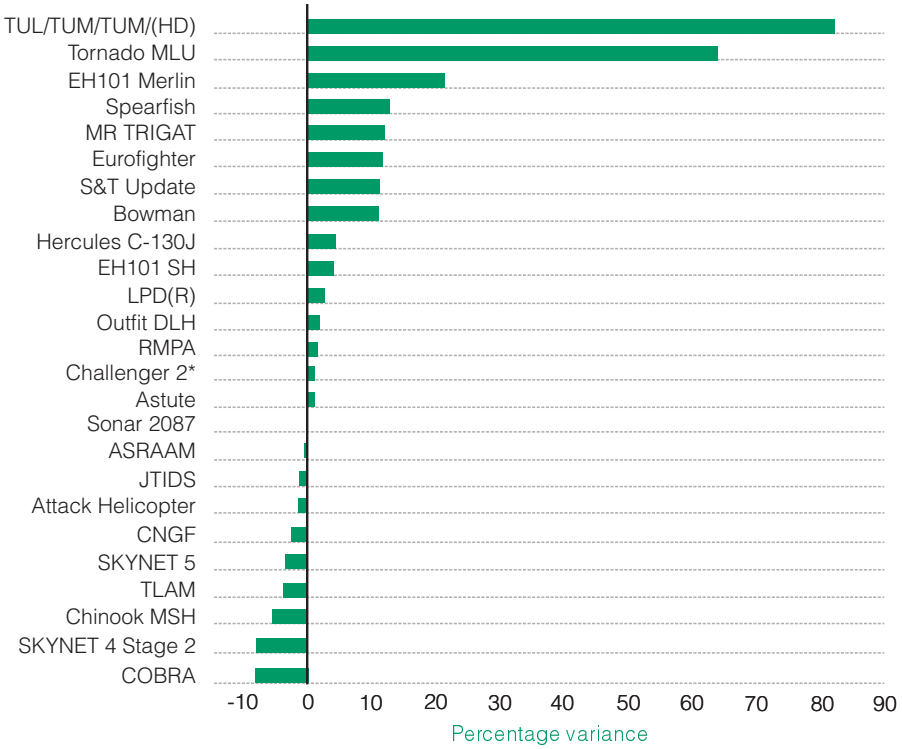
1.8 The estimated cost at 31 March 1997 of the 25 projects as presently approved, and at 1997-98 prices, is £36.9 billion, compared with total amounts originally estimated of £33.9 billion. There is a net forecast increase of £3,084 million (or 9.1 per cent), compared with the Major Projects Report 1996 when there was a net forecast reduction of £708 million (or 2 per cent) on the amounts originally estimated. The major factor in this difference is that the Trident programme no longer qualifies for inclusion in the Major Projects Report. At 31 March 1996, Trident had a forecast cost reduction of £3,498 million, which offset the variance on the other 24 projects.

1.9 The overall cost variance figure for 1997 includes a forecast increase of £1,489 million on the Eurofighter project. If this exceptionally large project is excluded, the data show a net forecast increase of £1,595 million (or 7.5 per cent) for the other 24 projects. This compares with an overall net forecast increase of £1,403 million (or 8.7 per cent) in the Major Projects Report 1996. Although there has been a real increase in the cost of these projects of £192 million the percentage variance has reduced because the baseline for the 1997 Report is higher.

1.10 Figures 2 and 3 show percentage and actual cost variations for the 25 projects. Cost increases are forecast for 15 projects, compared with 14 in 1996. One project is on budget compared with three in 1996, and nine show a forecast cost reduction, compared with eight in 1996.

Percentage cost variations

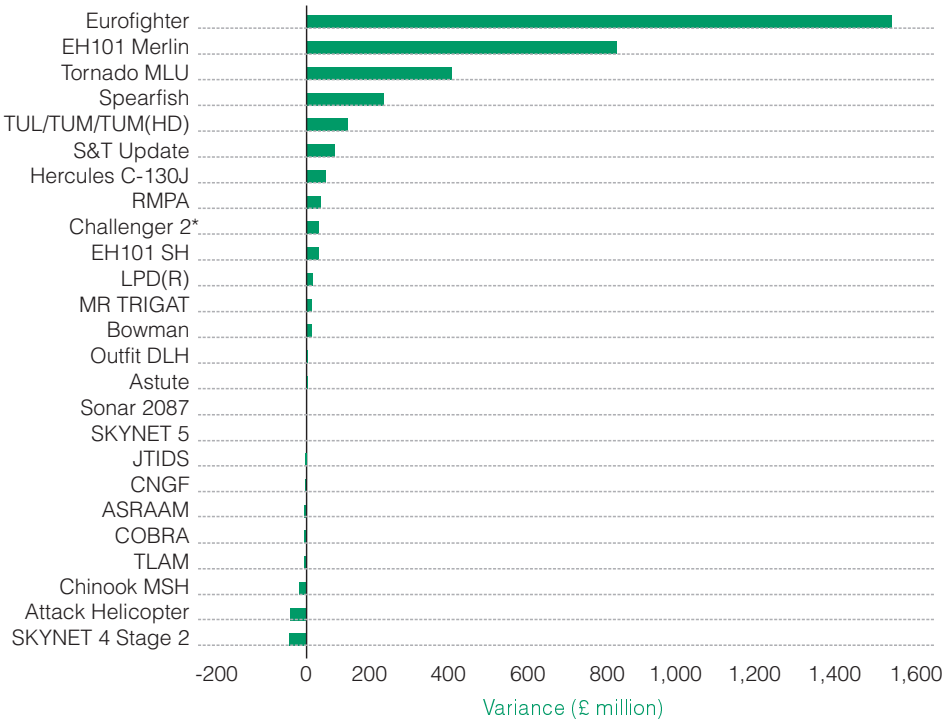
Figure 2



Source: National Audit Office analysis

*The cost for the Challenger 2 project includes Challenger Armament (CHARM 1)

Actual cost variations **Figure 3**



Source: National Audit Office analysis

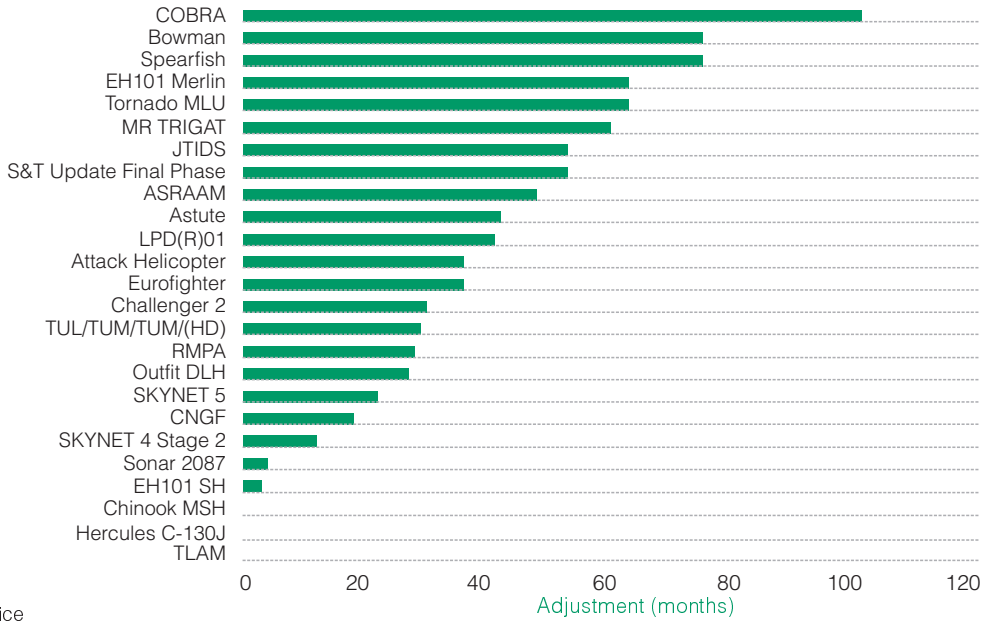
* The cost for the Challenger 2 project includes Challenger Armament (CHARM 1)

Meeting in-Service dates

1.11 Ten of the 25 projects have failed to meet their originally planned in-Service dates, compared with 13 in the 1996 Major Projects Report, and a further 12 are expected to enter Service later than originally planned, compared with seven in 1996. Six projects will enter Service five or more years later than originally planned. Three projects are expected to come into Service at the time originally planned, compared with five in 1996.

1.12 Figure 4 shows in-Service date adjustments by project, and Figure 5 shows currently projected in-Service dates. The average delay to in-Service dates is now 37 months, the same as in the 1996 Report. However, analysis of the 20 projects common to the 1996 and the 1997 Reports shows that slippage has increased by an average of 3 months for these projects since the 1996 Report.

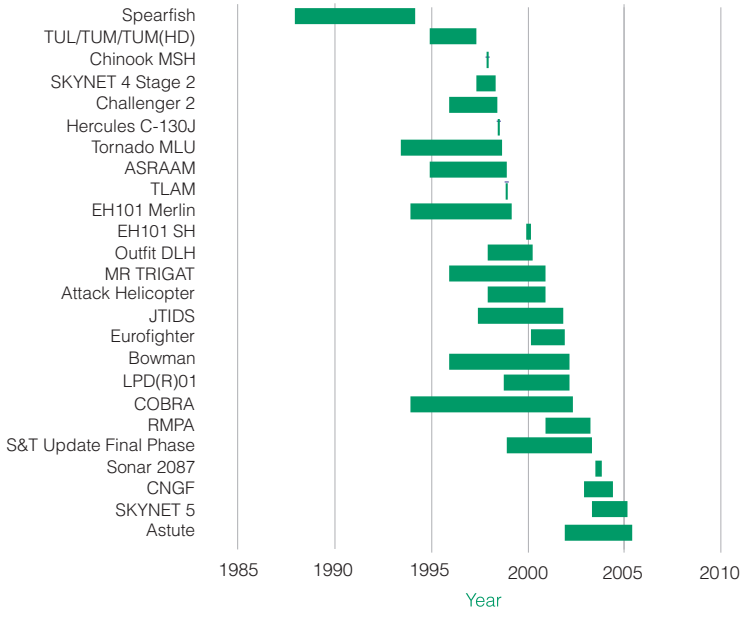
In-Service date adjustment **Figure 4**



Source: National Audit Office analysis

Note: A weighted average slippage is shown for JTIDS and TUL/TUM/TUM (HD).

In-Service dates **Figure 5**



Note: Weighted average in-Service dates are shown for JTIDS and TUL/TUM/TUM (HD).

Source: National Audit Office analysis

The left hand side of each bar shows the originally planned in-Service date, and the right hand side the current in-Service date.

Scope of the National Audit Office examination

1.13 The Major Projects Report is not a statutory account and the National Audit Office do not provide a formal audit opinion on the accuracy of data contained within it. They do, however, perform a number of test checks on the data which, for the 1997 Report, included:

- validation of the data in the draft Major Projects Report for a sample of 13 of the 25 projects reported; and

- confirmation that the projects reported were the top 25 projects by value (see paragraph 1.2).

The Major Projects Report is prepared on a different basis to the Appropriation Accounts and Treasury approvals of expenditure; there have been differences of interpretation over the guidelines for preparing the Report. For this reason the Department have welcomed the National Audit Office's assistance with training and validation.

1.14 Validation of draft 1997 project summary sheets led to changes in all 13 sheets examined by the National Audit Office, with eight requiring changes to overall cost figures. In part this related to estimates of future costs. In the validation of previous Major Projects Reports, the National Audit Office have accepted that the Department's Long Term Costings budget information represents the most accurate estimate of future project costs. This year, however, the National Audit Office noted that in three cases the Long Term Costings assumed lower rates of inflation than experience suggests are likely. These cases are detailed at paragraphs 2.9 to 2.11.

1.15 The main areas examined by the National Audit Office in relation to the 1997 Major Projects Report were :

a) An analysis of the Report including consideration of those projects showing the greatest additional cost variances and in-Service date changes since the 1996 Major Projects Report. The analysis includes a more detailed examination of the JTIDS for the Royal Navy and Sonar 2087 projects.

b) The commercial and contractual lessons that can be drawn from a detailed examination of Truck Utility Light/Truck Utility Medium (TUL/TUM) vehicles, Hercules C-130J, Astute class submarine and Bowman projects.

1.16 Summaries of the main points and any recommendations arising from the National Audit Office examination are contained within each section under the heading "Key Points", or "Key Points and Recommendations".

Key Points

1 Estimated total costs of projects are £3,084 million (9.1 per cent) higher than the amounts originally approved. If the exceptionally large Eurofighter project is excluded then the remaining projects show a forecast cost increase of £1,595 million (7.5 per cent), compared with a forecast cost increase of £1,403 million (8.7 per cent) in the 1996 Report (paragraphs 1.8-1.9).

2 Only three of the 25 projects are expected to enter Service at the dates originally planned and 22 projects have entered, or are expected to enter, Service later than originally planned. Six projects will enter Service at least five years later than originally planned (paragraphs 1.11-1.12).

3 The level of errors detected by the National Audit Office in draft project summary sheets remains significant (paragraph 1.14).

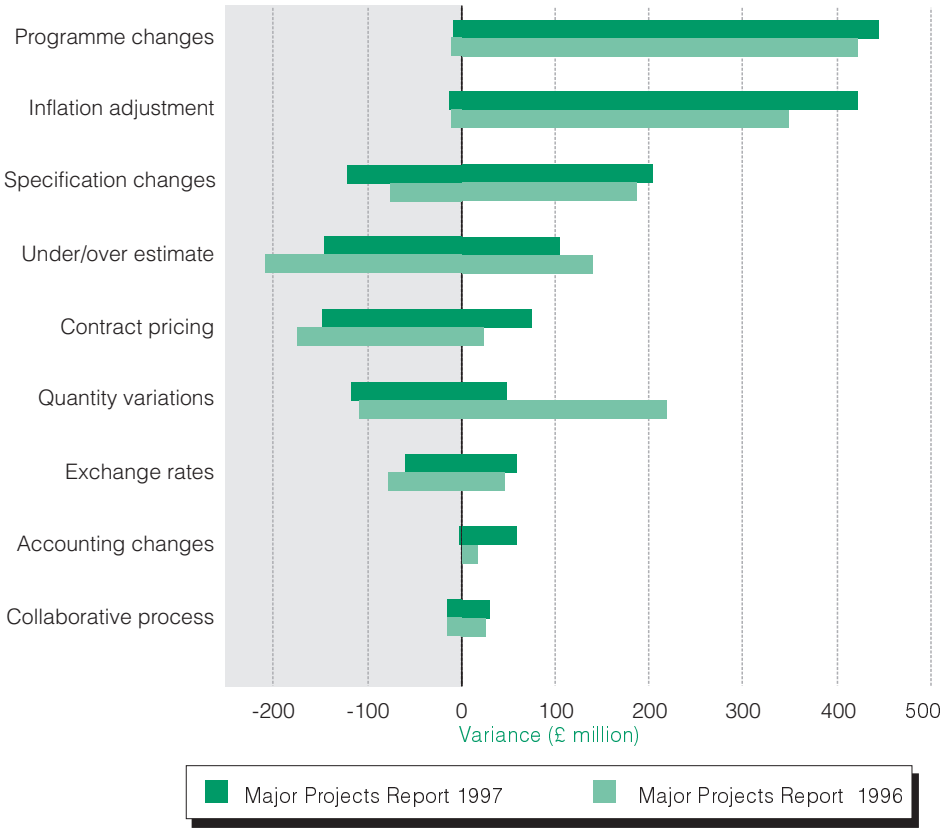
Part 2 : Analysis of project costs and timetables

Causes of cost variations

1.1 The cost change reported by each project in the Major Projects Report is the difference between the total of original cost estimates made at the first approval of each project stage and the current estimate of cost. Reported cost increases and decreases therefore capture all the changes in the estimated cost of a project throughout its life. These cost changes occur for a variety of reasons (see Figure 6). The cost variances on the **Eurofighter** and **EH101 Merlin** projects have been omitted from Figure 6 because their size tends to dominate all others. However, significant developments on these projects since the 1996 Report have been included in Figure 7 and subsequent relevant paragraphs.

Reasons for cost variances

Figure 6



Source: National Audit Office analysis

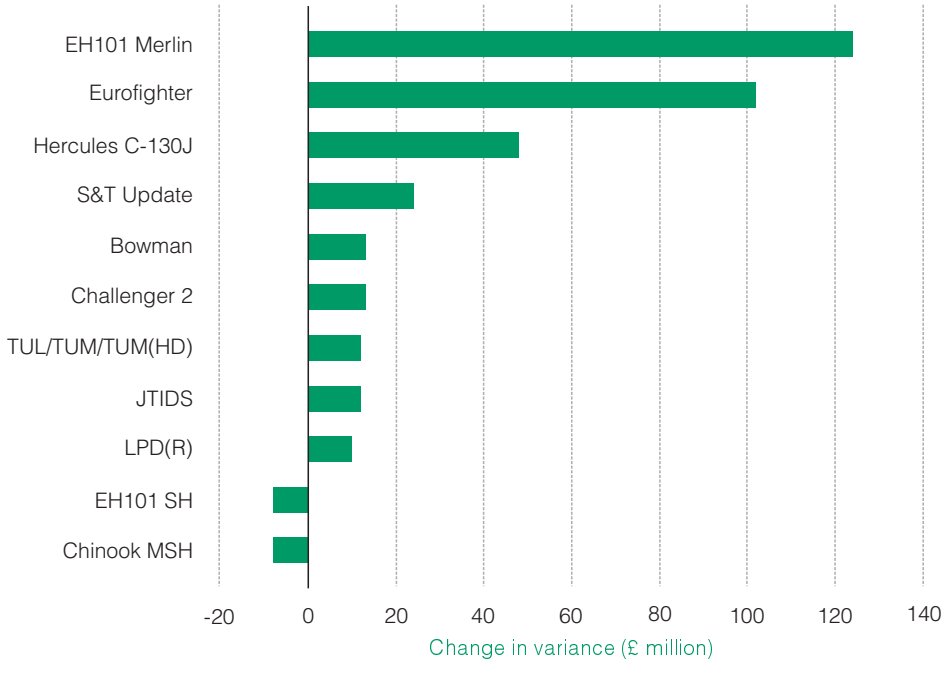
Note: Data for Eurofighter and EH101 Merlin omitted from Figure.

1.2 Figure 6 shows forecast cost increases and decreases for the remaining 23 projects and shows that the causes of cost increases and decreases are different. The main reasons for cost increases are changes to the programmes and inflation adjustments on projects exceeding the GDP deflator, the Treasury's measure of general inflation within the economy. The main reasons for cost reductions are initial over-estimates and negotiation of final contract prices lower than original estimates.

1.3 The National Audit Office analysed the changes between the 1996 and 1997 Reports for the 20 common projects to identify recent project cost changes. The projects which show the most significant changes are shown in Figure 7 below. The overall cost variance for the 20 projects has increased by £341 million. The change since 1996 is dominated by **Eurofighter** and **EH101 Merlin**. If the changes on these two projects are excluded, the cost variance on the remaining 18 projects has increased by £115 million. The National Audit Office have used 1997-98 prices as a common price base for the subsequent analyses.

Figure 7

Significant changes in cost variance between the 1996 and 1997 Reports



Source: National Audit Office analysis

Programme changes

1.4 The most common single reason for variance in project costs, accounting for almost 31 per cent of all cost increases, is a change to the nature, scope or timetable of a project. This situation is similar to that in the 1996 Report, and the majority of changes to programmes pre-date the reporting period for the 1997 Report. However, an accident to **EH101 Merlin** Pre-Production aircraft No.7 in August 1996 resulted in an estimated increase in costs of £75 million. This accident prompted industry to undertake a detailed design and manufacturing review of the components critical to flight safety in order to restore confidence in, and confirm the airworthiness of, the helicopter. Flying re-started in April 1997, having been suspended for eight months. The cost increase has resulted from the inclusion in the Merlin Prime Contract and the EH Industries Development contract of an indemnity for "flight risks" following the Department's normal format for such contracts. Under these circumstances, the Department bear the cost consequences of accidents to aircraft being tested as part of the development programme.

Inflation

1.5 Inflation adjustments resulting from the use of Variation of Price mechanisms to uplift fixed prices for inflation have caused a net total increase of £407 million in the cost of the 23 projects in Figure 6. This accounts for 29 per cent of all cost increases. Such cost increases occur when the Department and the contractor agree Variation of Price clauses which use indices which, when combined, escalate faster than the GDP deflator. The GDP deflator has been used since 1993 to uprate project approval amounts in the Major Projects Report, and is used by the Department as a benchmark against which to measure cost changes on major projects. The National Audit Office noted that for some projects, such as *****, the Department have begun to provide for any predicted excess inflation over the GDP deflator in the original project approval. However, this does not apply to the majority of projects covered by this Report.

1.6 Inflation adjustment continues to be a major cause of cost growth. The three projects which show the most significant cost changes since the 1996 Report all show estimated cost growth in the last year due to inflation. The estimated cost of **Eurofighter** has risen by £95 million to take account of forecast future inflation exceeding the GDP deflator for the production phase of the project. Production approval was given during early 1997, and the 1997 Report is the first time production costs have been reported. The estimated cost of the **Hercules C-130J** project has risen by £48 million since the 1996 Report, £27 million of which is due

to inflation adjustments. The **EH101 Merlin** programme shows further cost escalation of £45 million due to inflation adjustments between the 1996 and 1997 Reports. The National Audit Office have analysed the underlying causes of the Department's problem with inflation adjustments in the Box below.

Variation of Price Clauses

1. Variation of Price clauses in defence contracts are intended to reimburse contractors for inflation over the period of a contract whenever firm prices, which include a provision for inflation in advance, cannot be agreed. The Department's guidance on the formulation of VoP clauses is that output price indices should be used where possible as these take account of productivity improvements. However, appropriate output price indices are not readily available for most contracts and the Department are forced to agree Variation of Price clauses based on input price indices for labour and materials. The main features of the Department's guidance in these circumstances are that:

- Fixed prices agreed between the Department and contractors should take account of expected productivity improvements over the lifetime of the contract. The guidance recognises, however, that predictions of future productivity gains are somewhat speculative, particularly for contracts which will run for a long period.

- Inflation compensation should provide encouragement to contractors to control cost growth and seek further productivity improvements. In order to achieve this the guidance specifies that at least 10 per cent of the contract price should be non-variable (not subject to compensation for inflation).

- Indices used should be industry wide and therefore beyond the influence of any individual contractor.

2. As noted in paragraphs 2.5 and 2.6, the application of this guidance continues to result in project costs escalating significantly faster than the GDP deflator. The reason for this is that the GDP deflator measures inflation in the overall output of the economy and thus takes account of continuous productivity improvements which help to offset input price inflation. However, the Department's Variation of Price clauses are based on input price indices which do not take account of productivity gains. The continuing divergence of Variation of Price clauses and the GDP deflator is of concern to the Department because the uprating of the defence budget is informed by the GDP deflator, and any excess inflation above this level affects the continuing affordability of major projects unless any such excesses have been reflected accurately in the Department's project approvals and budgets.

1.7 As noted in the Box above, one element of the Department's guidance on Variation of Price clauses is that such clauses should contain a provision under which an element of the contract cost is not subject to increases for inflation, a non-variable element. As a result of their validation of project summary sheets, the National Audit Office noted that the Variation of Price clause applying to the production contract for **Active Decoy Round - Outfit DLH** does not conform to this guidance as it does not contain a non-variable element. This has added approximately £1 million to the cost of the project, and the National Audit Office estimate that this cost will increase over the lifetime of the production contract.

1.8 The Department informed the National Audit Office that during the negotiation of the contract for **Active Decoy Round - Outfit DLH** the prime contractor (GEC Marconi) unilaterally reduced their bid price by £11 million. The Department asked the contractor to advise them of the effect on the price if a non-variable element were included, but the contractor pointed out that the omission of a non-variable element had been factored into their revised bid and that they were unable to quantify the impact of including a non-variable element. It is the Department's view that, had they insisted on the inclusion of a non-variable element, the prime contractor would have added back into the price some of the £11 million reduction. The National Audit Office note that the Department did not insist on a non-variable element and did not attempt to quantify the cost of allowing the contractor full escalation of the contract price.

1.9 On a more general point, the National Audit Office found in their validation that for some projects the Department did not take account of known movements in appropriate inflation indices when estimating project costs for their Long Term Costings. Instead, they sometimes used a general estimate of inflation promulgated with guidance on preparation of the Long Term Costings, to be used when no better information was available. As a result, the draft project summary sheets did not always contain the best estimate of project costs. The Department underestimated the future contractually committed cost of some projects because the inflation assumption used has tended to be lower than the escalation of indices specified in contracts. Examples include:

- **Active Decoy Round - Outfit DLH**. The Long Term Costings provision had, over a number of years, been uplifted using centrally advised Departmental inflation assumptions which were lower than the indices specified in the production contract. The National Audit Office established that this had led to an understatement of approximately £5 million in both the Long Term Costing and the current estimate of cost as presented in the draft project

summary sheet. The National Audit Office, with the Department's assistance, reconstructed the current estimate of cost for the project, and the estimate shown in the project summary sheet compensates for the previous understatement.

- The production contract for **Active Decoy Round - Outfit DLH** has two Variation of Price clauses. One relates to 70 per cent of production costs covered by the prime contract, and is based on United Kingdom indices. The second relates to almost 30 per cent of production costs and is based on French inflation factors because it covers a sub-contract placed with a French company. At the time of the National Audit Office's validation neither the Department, the United Kingdom based prime contractor nor the French sub-contractor were able to supply the inflation indices which cover the sub-contract. The French sub-contractor has now specified and supplied the indices for the sub-contract which have escalated at a rate close to the Department's central assumptions for inflation adjustments.

- **Replacement Maritime Patrol Aircraft**. During their validation, the National Audit Office noted that the Department's estimate of project costs was based on a 2.9 per cent uplift of costs from 1996-97 prices to 1997-98 prices. This was the inflation factor they had used in their budgeting for 1998-99 onwards. The National Audit Office noted that this was likely to be an under-estimate of inflation on the programme, and subsequently the Department revised their estimate to 3.9 per cent. The extra one per cent has a large effect on a programme with an overall value of around £2 billion. *****. The Department's current estimate of the excess over the GDP deflator is £35 million after one year of the project. *****.

1.10 In addition, the National Audit Office noted that the Department had applied incorrect inflation adjustment indices on the **EH101 Merlin** programme when determining their Long Term Costings provision. This meant that their provision for inflation was understated by some £17 million. The Department have not corrected the data in the project summary sheet because the error did not become apparent until after 31 March 1997, the reporting date for the project summary sheets. However, in order to reflect the best estimate of the true project status at that date, the National Audit Office have used the corrected data in their analyses.

1.11 The under-budgeting in these cases can result in funding shortfalls when contractual payments are due. Furthermore, the budgets then fail to provide a best estimate of future costs to underlie reports to Parliament.

Cost estimating

1.12 At the time of the Department's approval of project stages, there is a degree of uncertainty which can lead to cost variations caused by under or over estimation. Under or over estimates contribute to both increases (7 per cent of the total) and decreases (23 per cent of the total) in estimated costs.

1.13 The revision of initial estimates in the last year has contributed to changes in cost variance on a number of projects. There has been an increase in variance of £13 million on **Challenger 2** because tender prices for one element are higher than originally estimated. Similarly on the **TUL/TUM** vehicles project unit production costs have been higher than estimated (+£6 million). The Department have increased the estimated cost of trials and support tasks for the **Bowman** project, adding £13 million to project costs. The cost variances on **Chinook MSH** and **EH101 Support Helicopter** have reduced since the 1996 Report as initial over-estimates of costs have been revised. On **Chinook**, this reduction resulted from a change from the fixed price contract assumed at the time of approval to a firm priced contract, and on **EH101 Support Helicopter** from a re-assessment of the resources required to meet the spares requirement. On **EH101 Merlin**, Value Added Tax (VAT) of £12 million was omitted from both approvals and budgets, because the price quoted by the contractor was thought to be VAT inclusive when in fact VAT had to be added. This £12 million has not been included in the project summary sheet because the error did not become apparent until after 31 March 1997 but the National Audit Office have included it in their analysis in order to reflect the best estimate of the true position at that date.

Specification changes

1.14 Specification changes on projects have added a net total of £81 million to the total forecast cost of the 23 projects in Figure 6. These changes account for 14 per cent of total cost increases, and 9 per cent of total cost decreases. Specification changes, after approval or contract placement, remain a major cause of cost variance, and such changes, whether they increase or reduce costs, should be fully evaluated in terms of both financial and operational impacts. Changes in the last year to the specification of **Hercules C-130J** to include additional channel spacing for the VHF radio have added £5 million to project costs. The changes were a result of a directive issued by the International Civil Aviation Organisation. Changes to the specification of **TUL/TUM** to include waterproofed vehicles for the Royal Marines have resulted in a £6 million cost increase.

Contract pricing

1.15 The process of contract negotiation and pricing causes cost variations on projects where the final contract price is different from that assumed at approval. The majority of these variances are reductions (-£148 million), resulting from the Department securing better prices through negotiations or because of cautious initial estimating. The £148 million reduction is not as large as the £175 million reduction in the 1996 Report, largely because the reductions detailed on the **Sea Harrier Attrition Buy** programme are no longer included. Final contract prices may also be higher than estimated at approval, resulting in increases to project costs in the 1997 Report of £75 million, compared with £23 million in the 1996 Report. The increase is largely due to the outcome of tendering and contractual negotiations for the **Attack Helicopter** being £52 million higher than expected.

Quantity variations

1.16 In the Major Projects Report 1996 changes to order quantities accounted for 16 per cent of variance, causing a net increase in total forecast costs of £109 million (at 1997-98 prices). There has been a substantial change in the 1997 Report, with quantity variations producing a net decrease in total forecast costs of £70 million. The change has been caused by the **Sea Harrier Attrition Buy**, which had significant cost increases because of quantity variations, no longer qualifying for inclusion in the Major Projects Report. There are only three projects in the 1997 report which are subject to cost changes caused by quantity variations: **Tornado Mid-Life Update** (-£109 million), **TUL/TUM** (+£48 million) and the **Attack Helicopter** where there has been a reduction in the number of air-to-air missiles required (-£9 million).

Exchange rates

1.17 Exchange rate variation on projects where costs are paid in foreign currencies accounts for a net cost reduction of £2 million, compared with a net cost reduction of £31 million in the 1996 Report. Cost increases of £58 million (or 0.9 per cent of total approvals), which are largely concentrated on two projects (**Tornado Mid-Life Update** and **Medium Range TRIGAT**) are offset by decreases of £60 million (or 1.4 per cent of total approvals) mainly on the **Hercules C-130J** and **Attack Helicopter** projects. Increases have occurred between the 1996 and 1997 Reports on projects priced in United States dollars such as **Hercules C-130J** and **Chinook Medium Support Helicopter** as the forward buy rate for dollars has worsened between the reporting periods.

Key Points and Recommendations

1 Overall cost variance for the 20 projects common to the 1996 and 1997 Reports has increased by £341 million between the Reports. Of this, £226 million is due to cost increases on Eurofighter and EH101 Merlin (paragraph 2.3).

2 The most common causes of cost increases are programme changes and inflation adjustments. The most common reasons for cost decreases are savings made in contract negotiations and changes to equipment specifications (paragraphs 2.4-2.17).

3 The National Audit Office note that the Department are beginning to provide for the risk of Variation of Price clauses escalating faster than the GDP deflator in their approvals. This enables realistic financial planning and an informed comparison of options at the time of approval. The National Audit Office recommend that this practice should be extended to all appropriate new approvals (paragraph 2.5).

4 For three projects the Long Term Costings did not represent the most accurate estimate of project costs. The National Audit Office recommend that the Department review their budgetary procedures to ensure that project budgets take account of known movements in the value of contractually committed costs (paragraphs 2.9-2.11).

Causes of in-Service date changes

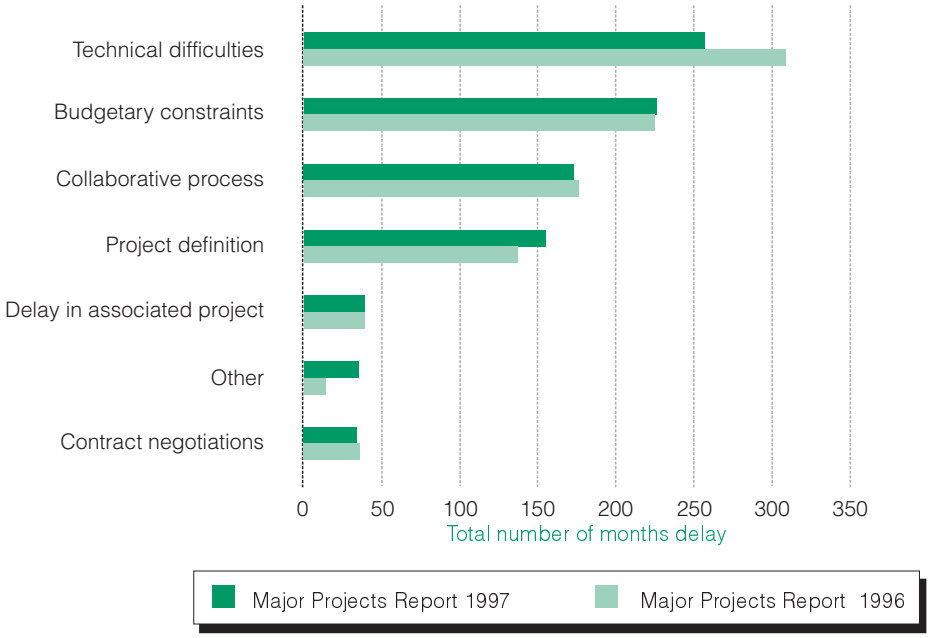
1.18 Adjustments to in-Service dates are caused by a range of factors. Figure 8 shows the main reasons for in-Service date adjustments, and the comparison between the 1996 and 1997 Reports. Figure 9 shows the projects where in-Service dates have been delayed significantly between the 1996 and 1997 Reports. Subsequent paragraphs examine the main causes of in-Service date adjustment, focusing on the most significant causes and on areas where there have been major changes between the Reports.

Technical difficulties

1.19 Technical difficulties have caused a total of 257 months of delay to the in-Service dates of the 25 projects. As in the Major Projects Reports 1995 and 1996, technical difficulties are the most common cause of in-Service date delay. Technical difficulties occur for a range of reasons, most of which relate to the specific nature of each project, and so it is not possible to identify any single underlying cause. The reason for the decrease in delays between the 1996 and 1997 Reports is that the projects new to the 1997 Report have less slippage due to technical difficulties than the projects they replaced. It is too early to identify a trend but this is an encouraging development and demonstrates that the newer major projects are less prone to technical difficulties than the older ones.

Figure 8

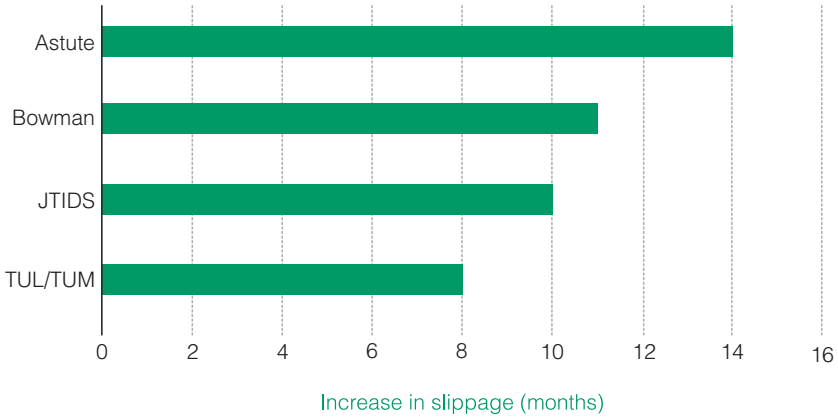
Reasons for in-Service date adjustment



Source: National Audit Office analysis

Figure 9

Significant changes to in-Service dates between the 1996 and 1997 Reports



Source: National Audit Office analysis

Note: Changes to JTIDS and TUL/TUM are weighted averages.

1.20 Further slippage on **TUL/TUM** has, however, partly offset the overall reduction in delays caused by technical difficulties. The TUL/TUM in-Service date has been delayed by 8 months between the 1996 and 1997 Reports for two main reasons. First, the contractor did not complete the support package and documentation for TUM. Secondly, there were braking problems with TUL and TUM. In addition, the in-Service date for TUL was rescheduled to allow for the completion of reliability trials. The technical problems were caused by the transition from development to production, a similar situation to Challenger 2. The circumstances leading to the overall slippage on the TUL/TUM programme, and the Department's commercial and contractual techniques for dealing with late delivery by a contractor in this case are examined in Part 3.

1.21 The project summary sheet (Appendix 1, page 101) for **Hercules C-130J**, shows a forecast in-Service date of July 1998, and shows no slippage from the originally approved in-Service date. The National Audit Office observed that, due to technical problems with the aircraft, the contractor has notified the Department that the delivery profile for the fleet will slip, and the in-Service date is unachievable. However, a revised in-Service date for the aircraft has yet to be formally approved, and the extent of the projected delay is not yet clear. The reasons for the slippage to aircraft deliveries and the Department's methods of dealing with non-performance by the contractor are examined in Part 3, in conjunction with the TUL/TUM case.

Budgetary constraints

1.22 In-Service dates are deferred because of budgetary constraints when the Department's forecast of total procurement costs exceeds their total annual procurement budget. In this situation the Department have to find ways of containing costs within their overall budget, and re-profiling their forecast expenditure. One method of achieving this is to defer projects where the Department consider the financial and operational penalties are least. Budgetary constraints account for almost 25 per cent of total in-Service date slippage, as they did in the 1996 Report. Ten of the 25 projects have been deferred because of budgetary constraints.

1.23 In seeking to match overall procurement costs to their overall budget, the Department have, in some cases, cancelled or merged projects. **Sonar 2087**, which is new to the 1997 Report, was created by cancelling and then merging two other sonar projects, 2057 and 2080. The main driver in this decision was the need to

adjust overall costs to accord with overall funding constraints. The Box below explores the rationale for the cancellation and merger of the two former projects to produce 2087, and the consequences of the decision, one of which was to defer the in-Service date of a new sonar system.

Sonar 2087

Background

1. Sonar 2087 is a passive and active, tactical variable depth sonar suite, under development for the Royal Navy. The requirement for this kind of system was originally to be met by two sonar projects, sonars 2057 and 2080. These projects were cancelled in 1993, and a new project, Sonar 2087, was endorsed by the Department, combining the two earlier projects

2. Sonar 2057 had an in-Service date of 1998, and had completed feasibility study and project definition phases. At the time of cancellation £22 million had been spent. Work on sonar 2080, which was supposed to be fielded in 2002, was much less advanced when the project was cancelled.

3. The decision to delay 2057 and 2080, and then to merge the projects, enabled expenditure to be re-profiled as part of the overall need to identify savings in the 1993 Long Term Costings. The decision was subject to an investment appraisal and financial scrutiny in the Long Term Costings process, but there is little documentary evidence of a formal evaluation of the full operational impact of the decision. The National Audit Office therefore examined:

- the extent of technical value carried forward from 2057 and 2080 into the new project;
- the costs and benefits, in financial terms, of the cancellation and merger decision; and
- the operational impact of cancelling and combining the two projects.

Transfer of technical value

4. When sonar 2057 was cancelled substantial progress had been made towards producing a technically acceptable system. There are a number of specific areas where work on 2057 benefited the new project :

- towed array design;
- research work on thin arrays;
- ship fitting design work; and
- in addition, all the work done on 2057 was made available to the potential contractors for 2087.

continued ...

5. The 2057 system was intended to be fitted to Type 23 frigates and it was also intended that derivatives should be fitted to nuclear submarines.The submarine part of the requirement was transferred to another project, sonar 2076, which benefited from work done under 2057. Much less work had been done on sonar 2080 when it was cancelled and, although all the information from the project was made available to 2087 contractors, it was of less value than the information from 2057.

6. Merging the sonar 2057 and 2080 projects integrated the active and passive sonar requirements within a single project. This allowed the development of common processing and operator interfaces and, by reducing the number of internal and external interfaces, produced a solution with lower technical risk.

Financial costs and benefits

7. The cancellation of 2057 and 2080 resulted in a projected saving of £124.5 million (1997-98 prices) over the Long Term Costings period. However, there were a number of other costs which may have offset the saving, at least partially :

- the costs of cancellation were estimated to be £58 million, and were primarily costs which would be borne elsewhere, notably in providing a towed array for the Swiftsure and Trafalgar Class Update which could be adapted for use on other platforms; and
- the costs of extending the life of sonar 2031 were estimated as £65 million. These costs would not have been paid had 2057 gone ahead. The estimate also included the revenue foregone from being unable to dispose of 2031 before it became obsolete.

8. Taken together, these estimates indicate that the total cost of cancelling sonars 2057 and 2080 was £123 million, which almost entirely offsets the projected Long Term Costings saving of £124.5 million. The cancellation of sonars 2057 and 2080 did, however, postpone the costs of a new sonar system from the mid 1990s. However, the National Audit Office note that many of the estimates discussed above were made between 5 and 10 years ago and contain varying degrees of uncertainty. It is not clear from the available data whether there was an overall cost saving from the decision, particularly when the run-on costs of sonar 2031 are taken into account.

Operational consequences

9. Operational considerations were not the key driver in the decision to cancel and merge projects 2057 and 2080. However, the decision deferred the fielding of a new towed array sonar system. The operational impacts of the decision relate primarily to this delay, and the need to run-on the existing towed array system, sonar 2031, in Type 23 frigates.

10. Sonar 2031 will now be in service on Type 23 frigates for up to 8 years longer than anticipated. Sonar 2031 is becoming significantly less capable against modern conventional and nuclear submarines. The continued use of sonar 2031 on board Type 23 frigates reduces their effectiveness in their primary role of anti-submarine warfare.

11. The final five Type 23 frigates will not be fitted with sonar 2031. This is a deliberate decision by the Department based on value for money considerations. The Department do not believe that it is worthwhile fitting a largely obsolete sonar system, which will be replaced relatively quickly, to the new vessels. However, in operational terms, this leaves these ships without an area anti-submarine capability until sonar 2087 is fitted. This will restrict the Department's freedom in their operational deployment of this part of the Type 23 fleet.

The collaborative process

1.24 Problems caused by collaboration with other nations have delayed the in-Service dates of six projects, and account for a total of 173 months slippage. The projects affected by the collaborative process are the same as those in the Major Projects Report 1996, as summarised in the table (Figure 10). These delays are caused by a number of elements within the collaborative process which were detailed in the 1996 Report. There have been no further delays since that Report.

Projects delayed by the collaborative process

Figure 10

Project	Months delay
COBRA	78
ASRAAM	24
Medium Range TRIGAT	24
SKYNET 5	17
Eurofighter	16
JTIDS	14

Source : National Audit Office analysis

Note : The delay to JTIDS results from the need to maintain interoperability with the US Navy rather than from being part of a fully collaborative project.

Project definition

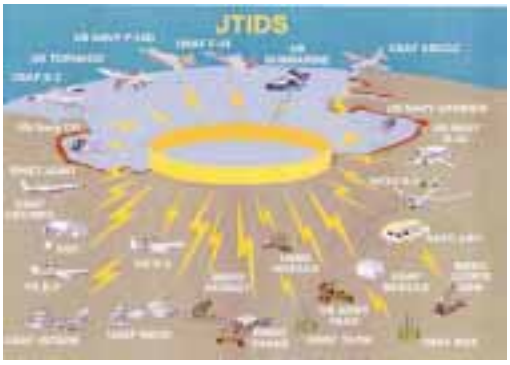
1.25 Delays caused by the need to extend the project definition phase, or to re-define a project, account for 16 per cent of all in-Service date adjustments. Changes to the definition of a project are caused by a range of factors. For example, the **Bowman** combat net radio project in-Service date has been deferred by a further 11 months between the 1996 and 1997 Reports. The delay has been caused primarily by the need to re-consider and change the procurement strategy to react to developments in industry. These developments, the new procurement strategy and the implications of these changes for the project, are considered in Part 3.

1.26 The in-Service date for the **Replacement Maritime Patrol Aircraft**, a project new to the 1997 Report, has been delayed by 28 months, the bulk of which relates to project re-definition. The original in-Service date was determined by existing equipment obsolescence. The date now forecast reflects industry's best estimates of what they can achieve following their responses to the Department's Request for Information and their tenders in the competition for the production contract.

1.27 The in-Service date for the **Joint Tactical Information Distribution System for the Royal Navy** (JTIDS) has been delayed by 11 months from the position reported in 1996, primarily due to changes to the programme stemming from project definition. A weighted average in-Service date and adjustment is shown for this project in Figures 4, 5 and 9 because it will be fitted to a range of naval platforms, each of which has a different JTIDS in-Service date. The 11 month adjustment to the weighted average in-Service date is a result of a delay, arising in the last year, of 18 months to the in-Service date for JTIDS on Sea Harriers, as set out in the following Box.

Recent slippage to the JTIDS in-Service date for Sea Harrier

Background



1. JTIDS is a joint tactical information distribution system which is currently in Service with the Royal Air Force and other NATO forces and will be fitted to naval ships and aircraft, one of which is Sea Harrier. The project comprises an upgrade to the aircraft's radar (conducted by GEC Marconi Avionics), the supply of JTIDS terminals by Rockwell-Collins and the integration of the JTIDS equipment with the Sea Harrier's existing avionics systems. Modifying the aircraft in this way has airworthiness implications and, as a result, the design implementation must be approved by the design authority for the aircraft - British Aerospace (BAe). This made BAe the natural contender to carry out project definition work.

2. BAe completed a project definition study, which was let by single tender, on the integration of JTIDS early in 1994. This study provided technical information covering changes needed to the avionics, specifications and plans for the integration work and the identification of technical risks. The study also produced timetable and cost estimates for the full integration programme. These findings underpinned the Department's subsequent approvals for full development and production.

Changes to project baseline

3. Following approval, the Department sought to place a firm price contract with BAe to conduct the integration work, based on the proposals made at the end of Project Definition. However, BAe informed the Department that there were issues outstanding and, in their view, changes had been made to the specification, which needed further work to clarify them. Without clarification of these issues BAe felt that there was too much risk for them to proceed into development under a firm or fixed price regime.

4. The Department explored these issues further to identify the real impact that they should have on the integration programme. There had been a change to a relevant NATO standard but this was identified as being minimal in cost and timescale terms. The major issues related to the mission processor and man-machine interface :

- **Mission Processor** : During their work BAe had assumed that the increased processing required to integrate JTIDS could be accommodated by upgrading the existing processor. Replacing the existing processor was investigated and costed as an option. A re-assessment by BAe of the processing load, after Project Definition,concluded that the processor would need to be replaced which required the software to be written in a

continued...

new high order language. This was regarded by the company as changing the Project Definition baseline. This had an impact on both the integration costs and timescales, which was well in excess of the original estimates of the integration costs derived from the Project Definition work.

- **Man-machine Interface** : The Department were aware at the end of Project Definition that there were a number of outstanding man-machine interface issues which they had assumed would be resolved during full development. However, before entering development, BAe argued that these issues carried too much risk for the company to proceed to development on a firm or fixed price basis.

5. In order to resolve these issues, and progress the integration programme, the Department agreed that the mission processor would be replaced, with the attendant cost increase and timescale extension, and that the programme would have to be altered. The major alteration to the programme was to take a phased approach to the integration task, which added a 12 month "pre-contract" work package (beginning in July 1995) which would resolve the outstanding issues and produce a revised costed proposal for integration development and installation.

Conclusions

6. The changes to the integration programme have added £21 million to the programme costs compared with the estimate at approval, and have caused the in-Service date for JTIDS on Sea Harriers to slip by 18 months.

7. Areas of ambiguity in the Project Definition specification were at least partly responsible for the subsequent delays and cost growth. Inadequately specifying the mission processing requirements and, despite costing an alternative strategy, not clarifying the position during Project Definition, led to increases in the costs of the integration programme. Leaving man-machine interface issues outstanding at the end of Project Definition also added time and cost to the programme.

8. BAe's position as design authority for the aircraft meant that the Department could not easily award the integration work to an alternative contractor. As a result the Department were unable to bring full competitive pressure to bear on the costs of the integration phase. The Department are conducting a review of the issues relating to design authority status.

1.28 The **Attack Helicopter** requirement was first approved in 1991, with a preferred in-Service date then stated as December 1997. The project summary sheet (Appendix 1, page 107) shows a currently projected in-Service date of December 2000, and shows a baseline in-Service date of December 1999 because the Department consider that the earlier date does not represent a proper baseline against which to measure progress on the project (see paragraph 1.5). The delay from December 1997 to December 1999 stems from a period during which the procurement strategy was debated, leading to a revised approach to competing the requirement and extra time for industry to prepare bids. The other 12 months delay was caused by adjusting the programme to take account of the Department's budgetary constraints. The National Audit Office analysis uses the preferred in-Service date estimated at first approval (December 1997) as the original in-Service date. This is consistent with the agreed guidance for the Major Projects Report which aims to bring out the actual pattern of procurement activity and estimated outturn.

Run-on costs resulting from in-Service date delays

1.29 New defence equipment is purchased either to add wholly new capabilities to those of the Armed Forces, or to replace obsolete equipment, and thereby enhance capability. In the latter case, delays to in-Service dates result in the equipment being replaced having to be run-on for longer than was planned. This can result in additional costs to the Department. In the Major Projects Report, therefore, the Department declare the run-on costs for each project where the original in-Service date has been delayed by 24 months or more, and which is intended to replace an existing equipment. All run-on costs are shown as net additional costs, the costs in excess of those required to support the new equipment, had it entered Service on time, except for the **EH101 Merlin** where the gross cost of running on Sea King is shown because the Department are unable to estimate a reliable figure for the running costs of the new equipment.

1.30 Eight of the 25 projects in this year's report have incurred net run-on costs due to in-Service date delays, with total run-on costs of £194 million. The majority of the run-on costs are on **Eurofighter** (£101 million). Three other projects show significant run-on costs: **Challenger 2, Landing Platform Dock (Replacement)** and **TUL/TUM.** One project **(COBRA)** shows a saving (£0.9 million) due to the deferral of the equipment in-Service date, and therefore the deferral of support costs.

1.31 In respect of three projects (**Astute Class**, **the Swiftsure and Trafalgar Class Update** and **EH101 Merlin**) the Department have stated that, although there probably are run-on costs associated with delays to those projects, they are unable adequately to identify or quantify those costs. This is due either to unreliable data or inability to capture the data. As the National Audit Office noted in the 1996 Report, such a lack of reliable information could adversely affect the Department's ability to judge accurately their budgetary priorities.

Key Points

1. The main causes of in-Service date delay are technical difficulties, and deferring projects to meet budgetary constraints. These factors were also the major causes of slippage in the 1996 Report (paragraphs 2.19-2.23).

2. The decision to cancel sonars 2057 and 2080 and combine them into sonar 2087 was driven by budgetary constraints. The delay to fielding a new sonar system has an unquantified financial penalty, and significant operational penalties (paragraph 2.23 and following Box).

3. The further delay to the JTIDS for the Royal Navy project in-Service date results from problems in the project definition phase for fitting to the Sea Harrier. BAe's position as design authority for the aircraft meant that the Department could not bring full competitive pressure to bear on the costs of the integration phase (paragraph 2.27 and following Box).

4. Delays to in-Service dates continue to result in extra costs to the Department for running-on existing equipment (paragraphs 2.29-2.31).

Trends in cost and time performance

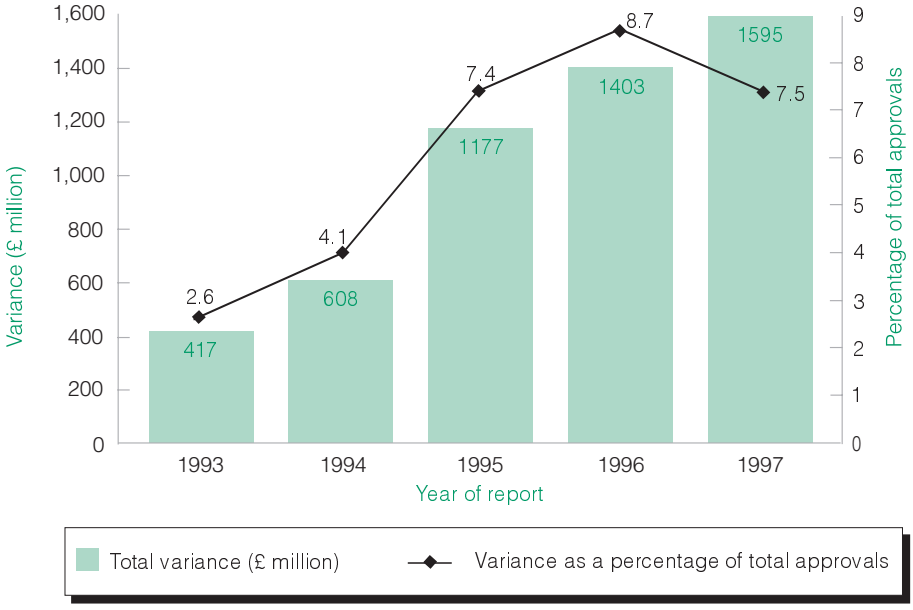
1.32 The Major Projects Report 1997 is the fifth report in the current format providing the fifth year of comparable data. The National Audit Office have conducted an analysis of the data, from the 1993 Report onwards, to identify any trends in cost and time performance.

Cost

1.33 The National Audit Office have compared the estimated overall cost variance reported in each year since 1993 and also analysed each year's variance as a percentage of total approvals. For consistency the analysis excludes Eurofighter and Trident which dominate other variances. Figure 11 shows the estimated cost variance for each year since 1993 as both an absolute figure at 1997-98 prices, and as a percentage of total approvals.

Figure 11

Total cost variance for the Major Projects Reports 1993 to 1997



Source: National Audit Office analysis

Note: Data from Trident and Eurofighter omitted from Figure.

1.34 There has been an overall increase in cost compared with approvals every year, and the year on year comparison shows growth in the level of cost increase in each year, from £417 million in the 1993 Report to the current figure of £1,595 million. There was a substantial increase between the 1994 and 1995

Reports from £608 million to £1,177 million. A large part of this increase was due to a change in the way that costs of the **EH101 Merlin** project were presented, which brought into the 1995 Report variance on the early development programme, which had not previously been included in the variance analysis.

1.35 The analysis also shows a similar pattern for cost growth as a percentage of approvals from year to year, except that in the 1997 Report the percentage has fallen because the total level of approvals has increased significantly.

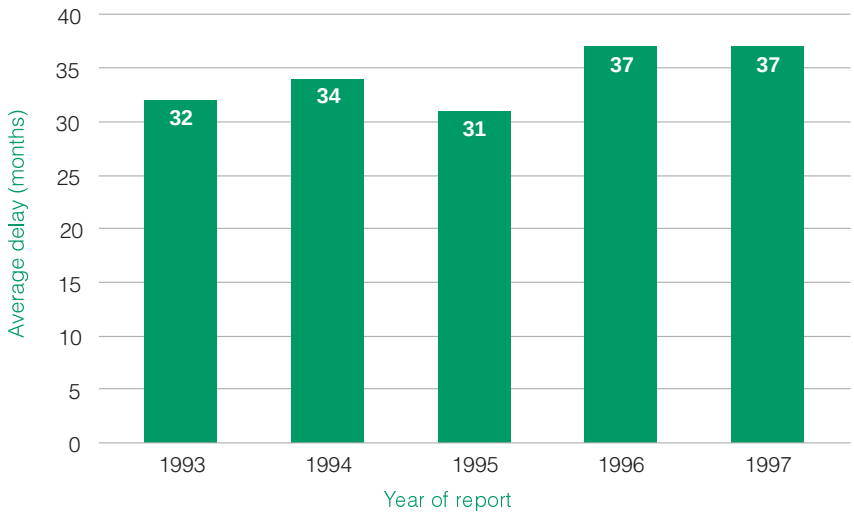
1.36 The National Audit Office analysed the changes in cost variance between the years to examine whether the causes of cost variance have changed over the last five years. The analysis showed that, while the levels of change in cost variance have varied since 1994, the pattern of causes has been broadly consistent. Programme changes, inflation adjustments, and specification changes have, in each year, been the major causes of cost increases. Differences between cost estimates at approval and those agreed in the contract have consistently caused decreases in forecast project costs.

In-Service dates

1.37 The National Audit Office have analysed the average in-Service date delay in each Major Projects Report since 1993. Figure 12 shows the average in-Service date delay for each year.

Figure 12

Average in-Service date delay for the Major Projects Reports 1993 to 1997



Source: National Audit Office analysis

1.38 The figure shows an increase in average in-Service date delay over the last five years, from 32 months in the 1993 Report to 37 months in 1997. The National Audit Office analysed the total in-Service date delay in each Major Projects Report from 1993 onwards and examined the causes of the slippage to see if the causes have changed over time.

1.39 The analysis showed that the pattern of causes of in-Service date delay has remained broadly consistent since the 1993 Report. Technical difficulties, the need to redefine a project and deferring projects to match overall funding constraints have been, and are, the most significant causes of in-Service date delay. Budgetary constraints have been the largest cause of increases in in-Service date delay in each of the last three years. Problems with the collaborative process have consistently delayed in-Service dates over the five years since the 1993 Report, although they have not been responsible for any of the change in levels of in-Service date delay between the 1996 and 1997 Reports.

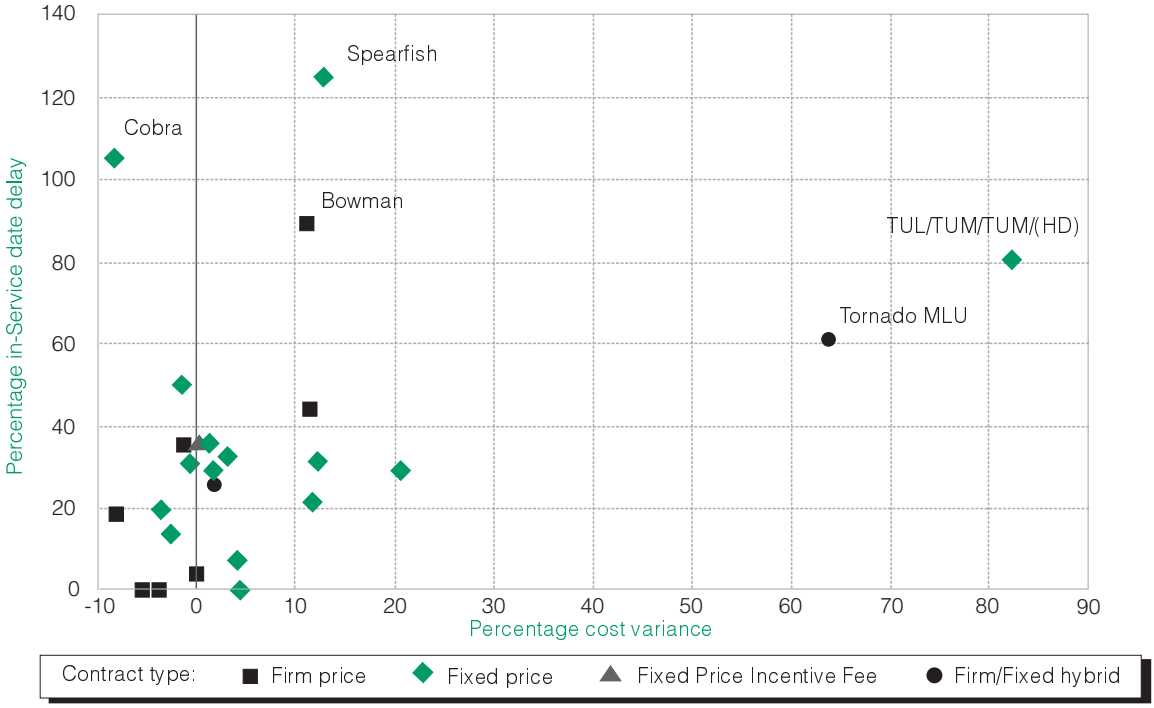
Relationship between cost variance and in-Service date delay

1.40 The National Audit Office examined the 25 projects in the 1997 Report to establish whether there is any association between cost variance and in-Service date delay. Figure 13 shows the cost variance and in-Service date delay for each project. The cost variance is calculated as a percentage of the project's approval and the in-Service date delay is calculated as a percentage of the originally planned length of the programme. The projects in the figure are coded, by colour and shape, according to the type of main contract - fixed price, firm price, a mix of fixed and firm price, or fixed price incentive fee.

1.41 Figure 13 demonstrates that there is a weak association between time and cost variance for the 25 projects. If the **COBRA** project, which has suffered extreme delays through collaborative negotiations whilst incurring relatively little expenditure, is omitted the correlation between time and cost variance is significant - and most clearly illustrated in the cases of the **Tornado MLU** and **TUL/TUM/TUM (HD)**. In the former case the variances largely occurred before the project became firm-priced and in the latter case the variances arise from increases in unit prices and quantities, changes in the mix of vehicles required and problems with reliability. The correlation remains significant even if these two projects, along with **COBRA**, are omitted.

Figure 13

Relationship between cost variance and in-Service date delay



Note: Definitions of contract types are given in Appendix 3

Source: National Audit Office analysis

1.42 The existence of an association between time and cost variance demonstrates that for major projects the Department have not yet managed completely to break the link between time delays and cost increases. However, the relationship is not a direct product of the form of contracts as in the days of "cost plus" contracts. It arises because the Department have, in general, tended to underestimate both the timescales for projects, and their cost. The use of particular types of contract, such as fixed or firm price, does not affect the outcome because in some cases cost overruns occurred before the main contract was let and in others the terms of the contract were varied, for example by increasing quantities and changing specifications.

Key Points

1 Estimates of cost variance have grown over the past five years, although as a percentage of approvals the cost growth may now be stabilising. The main causes of cost growth have not changed over the five years (paragraphs 2.33-2.36).

2 Estimates of delays to in-Service dates have grown slightly over the past five years, and the main causes of delays have not changed in the period (paragraphs 2.37-2.39).

3 Projects in the 1997 Major Projects Report evidence a continuing, if indirect, association between cost and time overruns. The use of particular types of contract, such as fixed or firm price, does not affect the outcome which results from the Department's tendency to underestimate both timescales and cost when projects are approved (paragraphs 2.40-2.42).

Part 3 : Commercial and contractual lessons drawn from four projects

Introduction and scope

1.1 The National Audit Office selected four projects from this year's top 25 for detailed examination, concentrating on the commercial and contractual lessons which can be drawn from recent events on those projects. The four projects examined were :

- Astute class submarines;
- Bowman combat net radio system;
- Hercules C-130J transport aircraft; and
- TUL/TUM utility vehicles.

1.2 The Astute class submarine and Bowman projects were selected to enable the National Audit Office to examine the effects of changes to a project's procurement strategy from competition to a single tender approach. The Hercules C-130J and TUL/TUM projects were selected because there have been recent technical problems which have resulted in the equipment not meeting the specification and requiring rectification work which has delayed the in-Service date. The Department addressed this risk at the outset through liquidated damages clauses in the respective contracts. The National Audit Office have examined the application of contractual remedies on these projects and drawn out lessons which can be applied to future projects.

Procurement strategies

1.3 The Department may adopt a variety of strategies to a given procurement, but one of the most important choices is between competition or single-tender, although the choice is becoming increasingly constrained by rationalisation within the defence industry. The Department's preference is to use competition where possible, but where, for reasons of national capability or market circumstances, there is only one suitable supplier, they move to a single-tender approach. Where a non-competitive strategy is pursued, the Department aim to agree prices and commercial terms before a contract is placed. This approach is known as No

Acceptable Price No Contract (NAPNOC). Pricing is conducted in accordance with arrangements established for non-competitive contracts subject to the Government Profit Formula. Under these arrangements the Department have equality of information rights to place them and the contractor in the same position at the time of pricing.

1.4 The main feature of NAPNOC is a clear objective to agree contract prices at the outset for the main stages of project work, rather than let work proceed on a less formal basis, while objectives are firmed up. Contract prices should be based on the Department's estimate of what it should cost an efficient contractor to carry out the work. NAPNOC is intended to introduce an element of competitive pressure to single tender negotiations and maintain a proper cost discipline on the supplier.

1.5 Since NAPNOC requires a significant degree of effort to obtain and analyse supplier data, it puts a heavy burden on the Department's project staff. A change from a competitive strategy to a single-tender approach in mid-procurement highlights the particular challenges of single-tender procurement to the Department, and the National Audit Office examined two recent instances of such procurements.

Astute Class

Background

1.6 In July 1994 invitations to tender for the Astute class (then Batch 2 Trafalgar class) were issued to VSEL and GEC-Marconi. In parallel both companies were offered risk reduction contracts in order to enable them - particularly GEC-Marconi who were new to submarine building - to proceed with the competition. Tenders were received from both companies in June 1995. GEC acquired VSEL, formally, on the same date as the return date for tenders. This forced the Department to select a preferred bidder more quickly than they had intended. The tenders were evaluated and GEC-Marconi were selected as the preferred bidder in December 1995.

1.7 Both tenders significantly exceeded the Department's budget. Coupled with GEC's acquisition of VSEL, this led the Department to undertake a period of NAPNOC negotiations with the preferred bidder. Negotiations lasted until March 1997, and are largely responsible for the recent delay to the Astute class in-Service date.

Procurement strategy

1.8 The procurement strategy for the Astute class represented a break with previous practices for submarines because:

- it was the first time that a prime contractorship route had been used;
- prime contractorship was coupled to using a "whole boat" strategy (see Appendix 3) and buying in batches;
- the requirement given to contractors was a statement of functions and performance rather than a detailed technical specification and design, intended to encourage the contractors to innovate in their designs; and
- the development stage was truncated in that the Department passed design responsibility to the competing contractors.

1.9 This approach allowed the contractors maximum flexibility and room to innovate in their designs. It was also intended to pass as much risk as possible in design, production and support phases to the prime contractor. The Department recognised, however, the possibility that the bidders would find such a broad specification insufficiently detailed, and the transfer of risk too great and unbalanced, leading the bidders to include unacceptably high levels of contingency in their prices.

1.10 In fact, the initial bids were unaffordable by a substantial margin, largely due to the inclusion of very high levels of risk contingency. The NAPNOC process needed to develop the contractor's understanding of the risks, and thereby reduce the contingency and, by persuading the contractor to move towards the Department's view of cost, to reduce other elements of the bid price to within affordability levels. The Department took a three phased approach to the process - Phase 1 being risk reduction and definition work, Phase 2 detailed costing and Phase 3 final negotiations.

1.11 The main activities in the three phases were :

- GEC-Marconi were awarded risk reduction contracts totalling £9 million to address the specific areas of highest technical risk and develop design and production techniques. The Department could find no directly attributable impact on the subsequent bid price, although they believe it contributed to reducing the final price by informing discussions of technical risk.

- Using data from previous submarine contracts, shipyard contracts, and internal costing data, the Department prepared a detailed "should cost" baseline for negotiations. This strengthened their position and enabled the Department to challenge the contractor's estimates where these appeared excessive.

- The final negotiations reached a compromise over the price, which had reduced to affordable levels and the agreed form of contract and terms and conditions.

1.12 The NAPNOC process was lengthy, for which the initial procurement strategy was partly responsible, and has delayed the in-Service date by 9 months. The compromise reached represented a substantial reduction in price from original tenders, and the availability of detailed and accurate "should cost" data was a significant factor in achieving a reduction. Detailed discussion and clarification of the specification, and establishing clear acceptance procedures were also key areas in reducing the contractor's perception of the risks and costs, and minimising the risks to the Department.

1.13 There are areas of the final agreement where the Department, as a product of the negotiations, were not able to secure all their objectives, and meet their deadline for contract award. For instance the use of a Fixed Price plus Incentive Fee pricing structure (see Appendix 3) leaves a greater level of risk with the Department than their original intention to use either a firm or fixed price. The pricing structure adopted should, however, provide an incentive to the contractor to minimise costs, and hence the price to the Department, while allowing the contractor to maximise his return through the incentive fee.

1.14 In order to incentivise the contractor further, the Department are agreeing, on a gradual basis, milestones in the programme which must be met before the contractor will be paid. These are intended to link payment directly to the earned value (see Appendix 3) on the programme. The Department intend to review the milestones, and the level of payment attached to them, regularly to ensure that the incentive is maintained and relates to significant achievements.

1.15 There are some areas of the contract, and the price, which have yet to be finalised, notably the overhead recovery rate for the boat builder VSEL. While this level of overhead recovery is capped, the level is higher than the Department consider to be realistic. Negotiations are still ongoing, and the target cost element of the price will be adjusted to reflect the outcome.

Bowman

Background

1.16 Bowman is a combat net radio system to replace the increasingly obsolete Clansman system. The National Audit Office examined the Bowman project in detail in the Major Projects Report 1995 (C&AG's Report, HC677 of Session 1995-96). Since that examination there have been significant developments on the project.

1.17 The procurement strategy for Bowman was a competition between two industrial consortia, Yeoman and Crossbow, which were led by Siemens Plessey Systems and ITT Defence (UK) respectively. The project was to be conducted in two stages, the first providing basic capability, and the second enhancements to that capability which could not be adequately defined at the outset. Project definition contracts for stage one were let to both consortia to develop a solution, and the intention was to select one contractor at the end of that stage. Under the stage one project definition contracts the consortia were committed to funding 50 per cent of the costs (based on the original estimates) and the Department the other 50 per cent.

1.18 In December 1996 the two consortia announced that they would no longer be competing with each other for the Bowman production contract, and that they were forming a joint venture, Archer Communications Systems Ltd., to offer a combined solution. As a result the competition for Bowman collapsed, and the Department had to re-evaluate their procurement strategy. Having evaluated the options, the Department chose to adopt a NAPNOC approach.

Reasons for the collapse of competition

1.19 During the course of project definition it became clear to both the Department and the consortia that the programme was more technically complex than had been expected. The original requirement had been expressed in terms of a performance specification, rather than detailed technical specification and design. As stage one project definition progressed the consortia found that the technical advances required to meet the performance specification were greater than expected. With the Department's agreement the consortia extended their programmes in order to complete the stage one project definition tasks, slipping the in-Service date.

1.20 Extending the programme to cope with the unanticipated complexity of the programme also required the companies to invest more of their own funding because the Department's commitment was limited under firm price contracts. The companies were investing in the programme in order to produce a solution which would win the competition and secure the production contract. However, the losing consortium would receive no return on what were becoming substantial amounts of investment. The National Audit Office noted in the 1995 Major Projects Report that this had led to the consortia bearing a higher than expected share of the costs.

1.21 There was a possibility that one or both consortia would view the risk as too high and decline to continue the programme. This is essentially what happened. By late 1996 the level of funding required from the consortia was considered by them to be too great for either of them to continue given the risk of receiving no return. The consortia therefore took a commercial decision to form a joint venture, sacrificing the potentially very high returns, including exports, available to one consortium had they won the production contract, but guaranteeing both consortia some return on their investment in the programme.

Revised procurement strategy

1.22 Following the collapse of the competition the Department conducted an investment appraisal covering a number of potential new procurement strategies. Having evaluated the options, the Department found that there was no significant difference between the options considered, in terms of cost or operational capability. Their judgement was that proceeding with Archer Communications would meet both the requirement and the in-Service date with fewer disadvantages than the other options. The Department, therefore, elected to proceed on a single source (NAPNOC) basis with Archer Communications. Their intention was to use NAPNOC procedures only for the prime contract tasks, basically the systems integration work, and to require all sub-contract tasks to be subject to competition. The Department believed that, by value, this would result in NAPNOC for 10 per cent of the project costs, and competition for 90 per cent.

1.23 The sub-contract competition is of two types - full and limited. Full competition is completely open competition between companies who were part of the two original consortia, and other companies who were not originally involved. Limited competition is competition between companies who were part of the original consortia. The National Audit Office note that the Department will seek to ensure maximum sub-contract competition and that the competitions will be conducted in accordance with the Department's normal policy. The Department will have full visibility of, and be closely involved in, both the tendering and evaluation stages through writing the specifications jointly with the prime contractor and through their membership of the evaluation panels. However, the Department have no formal veto over the selection of sub-contractors. That responsibility, and the risks that go with it, lies with Archer Communications.

The risks of NAPNOC, and managing them

1.24 There are a number of risks to value for money stemming from the change to the procurement strategy. The major risk is that the Department may not be able to secure, through the NAPNOC process, prices as low as competition would have provided. There are further risks if the Department are unable to maximise sub-contract competition.

1.25 By reference to other NAPNOC projects, there are both strengths and weaknesses in the Bowman situation. In terms of strengths, the Department will have full visibility of the contractor's pricing. However, a clear weakness is that the Department have very little "should cost" data. The Department have never

procured a combat net radio system of this type, and in this way, before. The existing system, Clansman, is not comparable technologically and was procured so long ago, and under such different industrial and contracting conditions, that any data from that experience will be largely irrelevant.

1.26 The Department told the National Audit Office that they intend to address the lack of "should cost" data by, wherever possible, using price benchmarking. The possible extent of price benchmarking is still being investigated, but is planned to include the core VHF radio. In addition the Department told the National Audit Office that, in conjunction with Archer Communications, they are developing a cost model, intended to provide overall "should cost" data, for some areas of the system, to inform price negotiations.

1.27 Secondly, like the Astute class procurement, the Bowman procurement is based on a performance requirement rather than a detailed technical specification. However, Bowman has completed an enhanced project definition phase, and the companies within Archer Communications are experienced suppliers of this type of equipment. The performance requirement should, therefore, be relatively well defined, and the contractor's appreciation of the remaining technical risk well grounded. The Department have told the National Audit Office that they intend to ensure that prices do not contain an unreasonable level of risk contingency, and intend to seek, through the negotiations, to identify and minimise any remaining areas of risk in the specification.

1.28 The Department have placed a risk reduction contract, in advance of letting the production contract. They have told the National Audit Office that they intend to monitor this work to ensure it does address the areas of technical risk on the programme and has an impact on the price finally achieved.

1.29 There is an urgent need to replace Clansman which has significant operational deficiencies, and is expensive to maintain. Any further delays to the Bowman programme may put the project at risk of cancellation in favour of an alternative solution. As a result, the Department are under some pressure to place a production contract as quickly as possible. The National Audit Office note that the Department are continuing to evaluate fallback options. However, in pursuing the current strategy, the Department need to balance the pressure to proceed quickly against the potential weakening of their negotiating position which can result from time constraints.

Risks to sub-contract competition

1.30 It was the Department's intention, when they changed the Bowman procurement strategy, to subject 90 per cent of the production programme to competition. Experience to date, however, has revealed two factors which act to limit the extent or value of competition.

1.31 First, the Department found that competition between consortium members for a sub-contract did not deliver effective price competition, although it maintained differences in technical approach. Where the Department are not confident that limited competition has produced fully competitive prices, they have mandated the application of NAPNOC. This means that NAPNOC will now apply to 28 to 30 per cent of the production programme, rather than 10 per cent as originally estimated.

1.32 Secondly, the Department may have difficulty in introducing new firms, and thus fresh views on prices and technical approach, into sub-contract competitions. One of the major sub-systems in Bowman is the Local Area System, the contract for which will be worth around £250 million, and for which the Department attempted to promote full competition. The Department invited Computing Devices Canada to enter the competition against Hunting Engineering and Thomson CSF who were members of the two original consortia. However, Computing Devices Canada and Hunting have now combined their bids, which effectively reduces the scope of the competition. The Department would also like to hold a full competition for the High Capacity Data Radio, a sub-contract worth around £30 million. They invited a company who were not involved in the original consortia to enter a competition against two of the original consortia members. However, the external bidder was reluctant to become involved because they felt that the original consortia members would have a commercial advantage because they were part of the original consortia, and are now part of the prime contractor, Archer Communications, who will be choosing the High Capacity Data Radio supplier. The Department have informed the National Audit Office that the external bidder has registered an interest in bidding, and that one of the original consortia members has subsequently withdrawn.

1.33 Should teaming of sub-contractors become common, or contractors demonstrate reluctance to enter full competition on further sub-contracts, then the worth of the planned competitive approach for sub-contracts will be called into question. The Department have told the National Audit Office that, in these circumstances, the application of NAPNOC procedures would be widened. This would place further emphasis on the need to develop "should cost" information, or other ways of benchmarking the competitiveness of prices offered.

Key Points and Recommendations

1. In the case of the Astute and Bowman projects the Department were forced to move from competition to NAPNOC because of industrial factors. Industrial factors, and in particular the implications of defence industry rationalisation, are likely to apply more widely to major procurements in the future (paragraphs 3.6 and 3.17-3.18).

2. The experience of the Astute negotiations highlights :

   - that Departmentally funded risk reduction contracts may help to reduce tender prices as part of an overall NAPNOC strategy (paragraph 3.11);
   - that substantial price reductions may be negotiated but this can result in delay (paragraphs 3.7 and 3.10-3.12);
   - the value of good "should cost" data (paragraphs 3.11-3.12); and
   - the difficulty of meeting all performance, price and risk transfer objectives in view of the deadline for placing the contract (paragraphs 3.13-3.15).

3. On Bowman, the Department have informed the National Audit Office that they intend to :

   - monitor their risk reduction contracts to ensure they provide value for money (paragraph 3.28);
   - seek better "should cost" data, while recognising the limited United Kingdom and international experience with digital information networks of the type proposed (paragraph 3.26);
   - address the difficulties presented by the timescale pressures caused by the need to replace the obsolete Clansman system (paragraph 3.29); and
   - develop contingency plans to deal with any problems in securing competition in sub-contracts (paragraph 3.33).

4. More generally, the Department should ensure their guidance on NAPNOC takes account of recent experiences, such as on the Astute procurement.

Contractual Incentives: Use of Liquidated Damages

Liquidated damages

1.34 The Department often use liquidated damages to protect themselves from the direct financial effects of specified failings by contractors. The main features of the use of such clauses are:

- potential damages must be quantified in the contract, along with the precise conditions under which they may be recovered;

- damages must be based on a reasonable assessment of the costs which the Department would suffer, although in the event of a breach of the relevant contractual terms the Department may recover liquidated damages in full without enduring or establishing loss; and

- the form and question of damages must be such that they cannot be construed as a penalty - unenforceable under English law.

1.35 In addition, once the Department have taken such contractual powers, there is a presumption that the Department should use them if able to - or note the accounts with a statement of loss. In previous Major Projects Reports, we have described the circumstances when liquidated damages clauses have not been fully implemented in the event of breach of contract. In this Report, we have looked at two instances where liquidated damages are being recovered, and which offer different perspectives on the value of such clauses.

Hercules C-130J

Background

1.36 An invitation to tender for aircraft to replace the existing Hercules C-130K fleet was issued to Lockheed in January 1994. In December 1994, the Department announced their intention to procure a fleet of 25 Hercules C-130Js. A fixed-price contract was signed with Lockheed Martin in March 1995 for an off-the-shelf purchase of the 25 aircraft together with a suite of Synthetic Training Equipment and a comprehensive Contractor Run Interim Logistic Support package. The cost of the programme was then estimated as £1.1 billion, and the in-Service date, defined as delivery of the twelfth aircraft, was set as July 1998.

1.37 The Department assessed the potential risks to performance and acquisition costs associated with the C-130J purchase as low overall, and the risk to programme deliveries as medium. The risk of meeting the delivery schedule was largely transferred to Lockheed Martin through the payment provisions and inclusion of liquidated damages in the contract.

Technical difficulties

1.38 The aircraft's flight test programme was delayed, initially, by the late delivery of avionic equipments and by difficulties with the integration of the new avionics system. The C-130J has largely the same airframe as the previous models, but has new engines and propellers, and entirely new software intensive avionic and cockpit systems. The contract requires Lockheed Martin to carry the risk of meeting programme requirements and therefore the Department did not engage directly with the resolution of the avionics problems, as this would have involved transferring risk, and cost, back to the Department. The first test flight occurred in April 1996, six months late, and was a success. However, following the late start to flight testing, and further slippage to the programme throughout 1996, it was recognised that the planned schedule of deliveries to the Royal Air Force could not be achieved and Lockheed Martin proposed a revised delivery schedule.

1.39 In order to adjust the contract to reflect the revised delivery schedule, the contract was amended in October 1996. The new delivery schedule recognised the need for a minimum interval between the delivery of the first two aircraft (destined for test and evaluation), and the start of deliveries to the Royal Air Force, as well as an acceptable rate of subsequent deliveries. These restrictions were necessary because the production of follow on aircraft at Lockheed Martin was unaffected by the earlier development problems. As a result, the delivery programme was in danger of becoming compressed to the extent that the rate of supply would have been too great for the Royal Air Force to absorb. The contract amendment revised the delivery programme to maintain the originally planned rate of release and in-Service date, but accepted delays to the first seven aircraft.

1.40 In late 1996 Lockheed Martin experienced further difficulties with their development and flight test programme. It emerged that the aircraft's stall characteristics were unacceptable without aerodynamic corrections or the introduction of a stick pusher. Engine lubrication problems also became apparent in neutral and negative 'g' flight manoeuvres. Lockheed Martin advised the Department in February 1997 that the October 1996 revised delivery profile could not be met. They estimated that the in-Service date would change from July 1998 to October 1998. Lockheed Martin advised the Department in September 1997 that, because of the time required to resolve the technical problems, there would be further slippage, and the projected in-Service date would be March 1999.

1.41 A test and evaluation programme is underway at Lockheed Martin, involving observation and participation by the Defence Evaluation and Research Agency on behalf of the Department. The results of this programme will form the basis for further limited testing in the United Kingdom to allow the Department to release the aircraft to the Royal Air Force for operational use. The Lockheed Martin programme continues to make slow progress in flight testing which, due to continuing development problems and Lockheed Martin's under-estimation of the time needed for software clearance, is holding up the release of the aircraft.

Impact of technical difficulties

1.42 The slippage to the delivery programme, and the in-Service date, has both a financial and operational cost to the Department. In financial terms, the Royal Air Force estimate that running on their existing fleet until its delayed replacement will cost an additional £14.3 million, including the costs of the extra aircrew needed for the existing fleet. Deferring the entry into Service of the new aircraft defers the projected operational savings which formed part of the procurement decision. The introduction of the new fleet is projected, by the contractor, to lead to an overall reduction of 38 per cent in support costs, stemming from better reliability and maintainability, and from increased equipment efficiency in areas like fuel consumption.

1.43 There is a significant operational penalty attached to the continued operation of the current fleet. In 1994 fleet availability for the old aircraft was at a relatively low level with a further decline estimated by the year 2000. The new engine and propellers enable reduced fuel consumption and higher ceilings to be achieved. Improved navigation systems will allow for greater accuracy in airdrop release operations through improved radar ground mapping and an ability to determine "real time" aircraft position. The introduction of Head-Up Displays promises better pilot performance.

1.44 Operational analysis work, conducted by Lockheed Martin, based on a hypothetical deployment of rapid reaction troops (such as the United Kingdom's Joint Rapid Deployment Force) to the extremes of the NATO area indicated that initial deployment could be completed 15 per cent quicker using the C-130J. Furthermore, over a ten day period, in supporting the deployment, over 50 per cent more in weight of stores could be lifted. Given the increased emphasis in UK defence policy and doctrine on the rapid deployment of relatively light formations of troops, both within and outside the NATO area, the delays in the introduction of the C-130J fleet have a significant operational impact.

Application of contractual remedies

1.45 The main contractual remedy for non-performance by Lockheed Martin available to the Department is the application of the liquidated damages clause included in the contract. Under this clause the Department are entitled to compensation amounting to 0.5 per cent of the price of an aircraft for each month that the aircraft is late. Individual delivery dates and prices were set in the contract for each aircraft. The amount per aircraft that the Department are entitled to is capped at a maximum of six per cent. Hence no further liquidated damages can be recovered after an aircraft is over 12 months late.

1.46 Following notification of the delays to the delivery of the first two aircraft, the Department informed Lockheed Martin that liquidated damages would be recovered. The first two aircraft were then delayed by five and three months respectively, but the rest of the delivery profile remained as originally planned. The liquidated damages due at this point amounted to almost £1.3 million. The contract amendment detailed earlier maintained the desired intervals between deliveries of subsequent aircraft and ensured that these intervals would be maintained should there be any further slippage to the programme. However, it did not affect the rate at which Lockheed Martin would produce the aircraft, with the result that Lockheed Martin would have to store aircraft produced in advance of their new delivery dates, in order to meet the customer's requirement for a manageable rate of delivery.

1.47 In order to avoid penalising Lockheed Martin for accommodating the customer's requirements by bearing the costs of pre-delivery storage and insurance, the Department agreed that legal ownership of the aircraft would pass to them when the aircraft were delivered into storage in the United Kingdom, and made ready for delivery to the Royal Air Force, at which point Lockheed Martin would receive partial payment. The Department also accepted that the baseline dates for liquidated damages recoveries for the third to seventh aircraft would be their revised rather than original delivery dates. Changing the baseline dates for liquidated damages recoveries meant that, at the time of the contract amendment, £1.5 million of run-on costs for the existing fleet caused by the slippage to the programme would not be offset by liquidated damages. The National Audit Office note that, due to the further slippage on the programme, the total liquidated damages now recoverable should be sufficient to compensate for the run-on costs of the existing fleet.

1.48 Under the revised contract Lockheed Martin will store and insure the aircraft at their own cost in the United Kingdom on the Department's behalf until delivery to the Royal Air Force can be effected in accordance with the delivery schedule. Legal ownership of the aircraft will pass to the Department when the aircraft are flown to the United Kingdom and are ready for delivery to the Royal Air Force. As in the original contract these ownership transfer and storage arrangements avoid the potential for having to pay Georgia State ad valorem property tax and five per cent sales tax which would be payable if the aircraft were owned by the customer while still in Georgia.

1.49 Since the contract amendment was signed, further technical problems have caused additional slippage to the delivery programme. According to the latest schedule provided by Lockheed Martin in September 1997, the first 16 aircraft will be delivered late. As compensation for the further delays in delivery the Department will recover liquidated damages, calculated from the revised delivery schedule, as agreed under the amended contract. The current estimate of Lockheed Martin's liability is £23.5 million.

1.50 Under the contract liquidated damages accrue on a monthly basis, but the contract does not specify when they are payable. The Department's current internal guidelines on liquidated damages allow for recoveries only after the delivery of the late article. There is a cost to the Department from following their own guidance and recovering liquidated damages after delivery rather than as they accrue because the Department forego the value of holding the money in the interim. In this case the cost will be reduced because the Department have negotiated an agreement with Lockheed Martin under which Lockheed Martin will pay accrued liquidated damages on a monthly basis beginning in April 1998. However, the Department did not recover liquidated damages as they accrued up to April 1998 and hence lost potential interest on the money from the end of December 1996. The Department are currently reviewing their policy on liquidated damages. The revised guidance should be issued in early 1998 and is expected to provide for damages being recovered as they accrue rather than after the delayed delivery of equipment. This accords with the National Audit Office's view of appropriate practice.

1.51 The Department should, however, recover sufficient liquidated damages in total to compensate for the costs of delay. Under the current delivery schedule the Department will be paying around £14.3 million to run-on the old fleet (including aircrew) and receive £23.5 million in liquidated damages. The National Audit Office have investigated a worst case scenario where every aircraft is at least a year late. Under this scenario the Department would be entitled to almost £54 million in

liquidated damages as compensation for estimated run-on costs of £20-24 million (not including aircrew). The damages are not intended to, and do not, offset the impact on operational capability that will result from the late delivery of the new aircraft.

Truck Utility Light/Truck Utility Medium/Truck Utility Medium (Heavy Duty) (TUL/TUM/TUM(HD))

Background

1.52 TUL/TUM/TUM(HD) are a range of four-wheel drive utility vehicles, used in command, front line and support roles. TUM and TUM(HD) are the larger variants used to transport support weapons teams and unit command groups and for the rapid movement of stores, personnel and command and control elements around the battlefield. TUL fulfils the liaison, fire control and reconnaissance roles.

1.53 In 1991, the Department decided to replace the majority of the current fleet of Land Rover utility vehicles, by holding an international competition, followed by competitive trialling and then placement of production orders. Having invited 19 companies to tender, the Department received three bids and, in 1992, selected vehicles for trialling from two companies. Land Rover were selected for trials of all three variants and Steyr Daimler Puch were selected for trials of TUM(HD).

1.54 In December 1993, Steyr Daimler Puch successfully completed trials for TUM(HD). However, Land Rover had encountered problems on the trials for all three variants and the trials were therefore suspended to allow for a rectification programme. In order to secure timely placement of the contract and minimise any delay to the vehicles' in-Service date, the Department decided to exercise the contractual option to split the TUM(HD) and TUL/TUM requirements. In June 1994 they awarded Steyr Daimler Puch the contract to supply 394 TUM(HD)s. TUM(HD) entered Service in May 1995. The quantities required have been increased twice, and the total TUM(HD) requirement is now 466 at an estimated cost of £27 million.

1.55 In June 1995, Land Rover completed their rescheduled TUL/TUM trials. Based on the results of these trials, the Department approved the procurement of 7925 vehicles (1440 TUL and 6485 TUM) in January 1996, and placed a contract with Land Rover in February. The order for 7925 vehicles represents an increase of 1665 from the original 1991 approval, and reflects the results of reviews of the support vehicle liability and further operational analysis.

1.56 Following deliveries of the first TUMs a braking problem was identified which also affected TUL. The Department therefore suspended further deliveries of TUM until the company rectified the fault. TUM entered Service in April 1997, 28 months later than originally planned, followed by TUL in September 1997, 33 months later than originally planned. The current estimated cost of the production phase is £205 million compared with an original estimate of £121 million. The cost escalation results from a number of factors : increases in the number of vehicles required; higher than expected unit costs; difficulties in estimating average unit costs for a mixed fleet while the liability was being reviewed; and changes made by the Department to the requirement.

Technical difficulties

1.57 Evaluation trials for supplier selection on Land Rover's TUM and TUM(HD) and Steyr Daimler Puch's TUM(HD) commenced in May 1993, including performance, reliability, user and other operationally related trials. For Land Rover's TUL variant, the Department performed limited evaluation trials due to the commonality of components between TUL and TUM.

1.58 Land Rover's vehicles were based upon an existing commercially available model modified for military use known as the Wolf 1. In September 1993, the trials for all three variants of Wolf 1 were suspended because the vehicles failed to meet the reliability (particularly the rear axle), mobility and payload requirements. This suggests that Land Rover may have underestimated the development work required to ensure that their existing vehicle range met in full the military specification and the trials regime. Land Rover manufactured a new vehicle (Wolf 2) for retrial and agreed to limit slippage to no more than 12 months from the then approved in-Service date of December 1994.

1.59 In September 1994, Land Rover submitted the new Wolf 2 TUM vehicles for re-trial. The TUL variant was not submitted for trials due to the commonality of components between TUL and TUM. The TUM trials were completed in June 1995 with reliability levels meeting the required targets - but with a warning from the Defence Evaluation and Research Agency that systematic failures of the rear axle differential and transfer box needed remedial action prior to production.

1.60 The Department had originally intended to award the production contract to Land Rover in October 1995, but approval was delayed for four months pending a satisfactory resolution of their concerns about the reliability of TUL/TUM. Subsequently, Land Rover carried out further trials on TUM and TUL to resolve these problems to the satisfaction of the Department. The TUL/TUM production contract was awarded to Land Rover in February 1996 with a revised in-Service date of September 1996, based on the delivery of 50 vehicles. The delay of 21 months to the in-Service date was primarily due to the reliability problems encountered during trialling.

1.61 The first production TUMs were received in July 1996 and were accepted and paid for on the basis of a depot inspection. When sufficient vehicles had been manufactured for a representative sample of production vehicles to be drawn, the Department began full confirmatory trials. These were designed to ensure that the production vehicles conformed to the contractual specification and that the transition from development to production had not affected performance; these trials included a full Production Reliability Acceptance test. The preliminary stages of these trials identified a braking problem affecting both TUL and TUM. The depot receipt procedures were not designed to identify this type of failing, and did not do so, although the depot receipt procedures did authorise payment. The Department suspended deliveries of TUM in September 1996. One hundred and sixty four TUM vehicles had already been delivered and paid for.

1.62 TUM deliveries recommenced in January 1997 when Land Rover isolated the cause of the braking problem and demonstrated a production solution to the satisfaction of the Department. The braking problem was caused by changes Land Rover had made to the specification of rubber bushes in the front axle during the transition from development to production. Whilst Land Rover notified the Department of the change to the build standard, neither party appreciated the consequences of the action.

1.63 Under the terms of the contract Land Rover are required to fund the cost of the re-trials and to make good the vehicles already delivered. TUM confirmatory trials were completed in March 1997. The Department had requested that TUL be subjected to the same full confirmatory trials as TUM. This was to ensure that the vehicles met the full contractual specification, including reliability, before they entered operational Service. A production sample for TUL was not available until April 1997. Confirmatory trials for TUL were successfully completed in September 1997. The results of the confirmatory trials showed that both TUL and TUM exceeded the reliability requirement by 340 per cent on average.

1.64 The in-Service date for TUL and TUM reflected the requirement that the vehicles should be supportable when entering Service. Achieving the in-Service date therefore depended on the availability of a full support package, including spares, publications, special tools and training packages. The availability of this support package was delayed for both TUL and TUM due to the poor quality of Land Rover's publications, and changes in the details of the spares lists, and the late delivery of some spares. Completion of the support package was originally planned for June 1996. In the event, it was not completed until March 1997 for TUM and July 1997 for TUL.

The cost and operational effectiveness impact of in-Service date delays

1.65 Problems with TUL/TUM reliability were identified during evaluation trials (see paragraph 3.57); subsequently there were technical difficulties stemming from the transition from development to production and delays to the support package. Taken together these problems have resulted in in-Service date slippages of 33 months for TUL and 28 months for TUM. The delays are primarily due to deficiencies in the vehicles submitted by Land Rover for trialling in 1993, together with the company's initial failure to perform in accordance with the 1996 production contract.

1.66 The delays to in-Service dates have both a financial and operational penalty. These are caused by the need to run-on the existing fleet of utility vehicles for longer than was expected. In financial terms, the additional run-on cost of the existing fleet is estimated to be £23 million.

1.67 The delay in fielding the new vehicles has impaired the Army's ability to manage the support fleet, and re-deploy vehicles to ensure that there are sufficient vehicles fit for operations. In particular, United Kingdom forces in Bosnia have suffered a lack of user confidence in the existing vehicles, and an increased logistic

burden, with a resulting degradation in operational effectiveness. The Department have not however sought to put a "value" on these problems because they cannot be readily quantified. Land Rover told the National Audit Office that they intend to compress the production and delivery programme, in part to mitigate these operational penalties.

The application of contractual remedies

1.68 The Department's contract with Land Rover for the supply of production vehicles contains provisions for liquidated damages in the event of non-performance. The Department negotiated liquidated damages on vehicles delivered late at the rate of one per cent of unit price per month up to a maximum of six per cent. This equated to about £200 per month for each TUL/TUM. Should deliveries slip by more than six months, then the Department are not entitled to additional compensation. The Department set the levels of liquidated damages by reference to the size of the contract and their estimate of the likely financial consequences of delayed deliveries. The Department considered that higher levels could be construed as penal damages, which are not permitted under English law.

1.69 Liquidated damages are payable only on vehicles delivered late and not those already accepted, even if they are subsequently discovered to be faulty or not to meet the contractual standard. The Department could not therefore claim liquidated damages on the 164 vehicles which were delivered and accepted before the braking problem became apparent, although the contract does provide for Land Rover to make good those vehicles, including the costs of any retrofitting. The Department paid some £4 million for these 164 vehicles on acceptance, and some £200,000 in liquidated damages would have been recoverable on these vehicles had they not been accepted.

1.70 Liquidated damages became payable following suspension of vehicle deliveries in September 1996. The Department initiated their recovery in December 1996 and by June 1997 the Department's recoveries had reached £371,000, covering late deliveries up to the end of January when deliveries recommenced. Land Rover did not contest any of the recoveries. Liquidated damages are paid as compensation for costs incurred due to non-performance by the contractor. In this case, in contrast to that of the Hercules C-130J, the liquidated damages relate to only a very small proportion of the slippage to the original in-Service date of December 1994 for both TUL and TUM.

1.71 The liquidated damages recovered cover less than two per cent of the additional costs of £23 million incurred by the Department as a result of slippage to the in-Service date from December 1994. The additional cost has arisen because the Department estimate that an extra £100 per vehicle per month will be spent in maintaining the existing in-Service fleet. The reason for the low overall recovery is that the production contract with Land Rover was not finally signed until February 1996, some 14 months after the original in-Service date. Liquidated damages were therefore recoverable only from the delivery schedule specified in that contract. The delay in letting the production contract arose because the vehicles supplied by Land Rover under the contract signed in November 1992 for the supply of trials vehicles did not meet the requirement (see paragraph 3.58). The subsequent "get well" programme,which Land Rover regard as a re-engineering programme, to remedy the defects in the vehicle slipped the in-Service date by 17 months.

1.72 In those circumstances the liquidated damages clause in the production contract has proved to be of limited use in protecting the Department against, and compensating them for, the additional run-on costs due to non-performance by the contractor on the project as a whole. The National Audit Office noted, however, that the level of liquidated damages on the production contract amounts to some £200 per vehicle per month for a period of up to six months. The Department are, therefore, protected against slippage on the production contract for a period of up to 12 months because the additional run-on costs of the existing fleet amount to £100 per vehicle per month.

1.73 The Department were also entitled to retain five per cent of the price of the sample of eight trials vehicles selected for confirmatory trials pending the satisfactory outcome of the trials. However, this was not an effective tool in incentivising Land Rover to meet contractual delivery targets because the total retention amounted to only about £10,000. The Department told the National Audit Office that these retentions were never intended to incentivise Land Rover and that the purpose of including them in the contract was not clear. The National Audit Office noted that:

- greater incentivisation on Land Rover would have been provided if the contract had allowed the Department to retain a percentage of the purchase price of all vehicles pending the results of confirmatory trials; and

- the support package was not given equal weight in contractual terms to delivery and other milestones and that this may have contributed to delays in providing the support package.

1.74 The National Audit Office recognise that if the Department had sought to incentivise the contractor in these ways the contractor may have sought to increase the vehicle price in compensation. However, trade-offs of this nature are common in contract negotiations and the National Audit Office recommend that in future the Department should explore with contractors the effect on price of a range of retention schemes. This would enable the Department to determine the level of risk that it was cost-effective for them to bear. The extent to which the contractor could include a premium in his price would, of course, depend on the level of competition.

1.75 Once the braking problem was discovered there was a powerful incentive on Land Rover to rectify the fault as quickly as possible. The main reason for this was that the Department withheld payment for all vehicles after the first 164, resulting in a total amount withheld of £23 million. A further incentive was provided by the recovery from Land Rover of £371,000 in liquidated damages.

1.76 The Department also negotiated an enhanced warranty as a reflection of their concerns over the reliability of TUL and TUM following the pre-production trials. The TUL/TUM warranty cost the Department an additional £555 per vehicle (£4.4 million overall). The enhancements comprise an extension of the warranty period to five years, from the normal two (£405 per vehicle), and a reliability warranty (£150 per vehicle) which requires Land Rover to make good the entire fleet should a systematic failure be demonstrated. There is very little in-Service reliability data available for TUL/TUM because the vehicles have not been in-Service for long. The warranty will ensure that, should there be a problem, the Department will not have to bear the costs of rectification.

1.77 The Department, in parallel with the review of guidance on liquidated damages (see paragraph 3.50) are reviewing their procurement strategies for utility vehicles. One element of this is a review of contractual remedies in the event of unsuccessful confirmatory trials. The Department have informed the National Audit Office that their initial findings are that:

- significantly increasing liquidated damages levels may discourage bidders, result in higher bid prices and could be challenged under English law;
- the inclusion of damages clauses covering “loss of use” after acceptance should be explored;
- payment retention levels could be extended or increased but not to levels which would discourage potential bidders or cause them to include a premium in their prices; and

- full payment retention until after acceptance would be impractical as it may prevent companies producing equipment for trialling.

1.78 The National Audit Office note these developments, but observe that such measures would not counter the element of the loss the Department suffered in this instance which resulted from problems experienced by the contractor at the evaluation phase.

Key Points and Recommendations

1 On both the Hercules C-130J and TUL/TUM projects technical problems encountered by the respective contractors have caused in-Service date slippage. In both cases the delay has a significant financial and operational impact (paragraphs 3.38-3.44 and 3.57-3.67).

2 The Department are seeking to recover liquidated damages from both Lockheed Martin and Land Rover as compensation for costs caused by in-Service date slippage (paragraphs 3.45-3.51 and 3.68-3.72).

3 On the Hercules C-130J project :

- The Department should recover sufficient liquidated damages to offset the run-on costs of existing aircraft (paragraph 3.51).
- The Department have negotiated an agreement with Lockheed Martin under which accrued liquidated damages will be paid monthly from April 1998. This will allow the Department to maximise the value of the liquidated damages from April 1998 onwards, but this would not have been possible had they continued to apply their current guidance (paragraph 3.50).

4 On the TUL/TUM project :

- Cost recovery through liquidated damages will be very small in relation to the total run-on costs incurred by the Department, and does not compensate for reduced operational effectiveness. Most of the run-on costs occurred as a result of problems in the trialling phase (paragraphs 3.71-3.72).
- Payment retentions covered only a small percentage of vehicle deliveries and did not provide an incentive to the contractor to meet contractual delivery requirements (paragraph 3.73).

5 The use of a full "Commercial off the Shelf" procurement strategy has provided the Department with full compensation for all contractor induced delays on the Hercules C-130J programme (paragraphs 3.36 and 3.51). However, the use of a separate contract for initial trials vehicles on TUL/TUM has neither ensured that production vehicles meet performance requirements nor provided compensation for the largest part of the contractor induced delay on the project (paragraphs 3.71-3.72).

6 The Department are conducting a review of their guidance on liquidated damages. Revised guidance will be issued in 1998. The Department are also reviewing their procurement strategy for utility vehicles, including contractual provisions for payment retention and cost recovery in the event of non-performance by the contractor. These reviews should take into account the National Audit Office's findings (paragraphs 3.50 and 3.77).

Appendix 1

MINISTRY OF DEFENCE

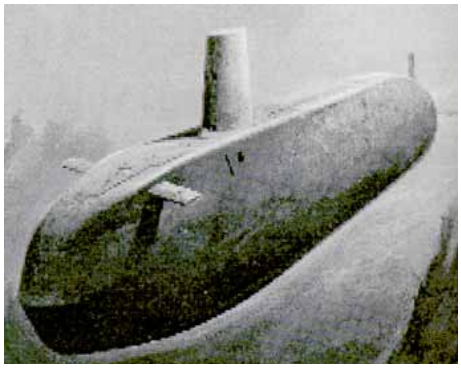
PROJECT SUMMARY SHEETS 1997

February 1998

Ministry of Defence
PROJECT SUMMARY SHEETS 1997

Contents

Batch 2 Trafalgar Class Submarine (B2TC) (Astute Class)



Director General Responsible:
DIRECTOR GENERAL SUBMARINES (DGSM)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

The Batch 2 Trafalgar Class (B2TC) submarine, Astute Class, is the planned replacement for the Swiftsure Class SSNs which will become life-expired early next century. Invitation to Tender (ITT) was issued in July 1994 with bids received in June 1995. GEC-Marconi was identified as the MOD's preferred bidder in December of the same year. Following protracted negotiations (adopting the policy of No Acceptable Price No Contract (NAPNOC)), a contract was placed with GEC-Marconi as the Prime Contractor on 14 March 97. The decision was announced on 17 March 97.

The Prime Contract with GEC-Marconi is for the design, build and initial support of 3 submarines. The support task will be undertaken by the prime contractor for a total of eight submarine years. The contract also includes the management of the existing MOD contracts for the Final Phase of the S&T Update integrated Tactical Weapons System, which are to be novated into it as a risk reduction measure for the similar equipment to be fitted to the new submarines.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
S&T Update Final Phase	2003
D154-Nuclear Submarine Refit and Refuel Facilities at Devonport	2002

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
GEC-Marconi (Full Development & Initial Production)	Fixed Price Incentive Fee	UK Competitive

PROJECT COSTS SUMMARY

(At 1997/98 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total
Current Estimate of Costs	30	1945	1975
Estimate of Costs at MOD Approval	35	1938	1973
Difference	-5	+7	+2

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Changed costing	-	3	Reassessment of costs due to VSEL's decision not to claim the costs directly for risk reduction work. (-£3m).
Accounting adjustments	-	2	Accounting adjustments due to change in revaluation factors (-£2m).
Inflation	7	-	Difference between specific indices and the GDP deflator (+£7m).
Total	7	5	

Total Balance	2

Expenditure to date (31 March 1997) £28m

Approval	Date	Explanation
First approval:	1991	Feasibility Studies
Latest approval:	1997	Full Development & Initial Production

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£1945m (Full Development & Initial Production)
Cost Change since Main Contract Award	£7m

IN-SERVICE DATES

ISD Definition: The date on which the first submarine contributes to the operational capacity of the Royal Navy.

Original ISD(Month/Year)	December 2001
Forecast ISD (Month/Year)	June 2005
Variation (Month(s))	+42 Months

EXPLANATION OF ISD SLIPPAGE

Factor	Increase	Decrease	Explanation
Budgetary constraints	28	-	The ISD for the First of Class has slipped owing to a variety of factors, including, principally, budgetary constraints, but also as a result of the evolving understanding of the many problems which are met by a project of this size and complexity (+28 months).
Programming constraints	15	1	Protracted negotiations due to the need for early down selection to GEC led to slippage in contract placement (+9 months). Lead time & Departmental financial planning pressures (+6 months). Decrease due to these factors acting concurrently (-1 month).
Total	43	1	

Total Balance	+42

COST OF ISD SLIPPAGE

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	7	-	Difference between specific indices and the GDP deflator (+£7m).
Total	+7	NIL	

Total Balance	+7

Year(s) of Peak Expenditure:	2003/04 & 2004/05
Further Expenditure in Clear Prospect: (at 1997/98 average forecast of outturn prices to the nearest £10m).	£870M

Unit Production Cost (UPC)	Quantities Required
***	Class of 5 submarines

SPEARFISH Heavyweight Torpedo

Director General Responsible:
DIRECTOR GENERAL SUBMARINES (DGSM)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

SPEARFISH is the most advanced anti-submarine and anti-ship torpedo in the world. Designed primarily to counter the threat from fast, deep manoeuvring submarines, its speed and endurance enable it to out-manoeuvre the fastest and deepest diving targets. It will replace the TIGERFISH torpedo in all Royal Navy submarines.

A contract for the Development and Initial Production (D&IP) of 100 torpedoes was placed with GEC- Marconi in 1982. Deliveries were subsequently suspended for 62 months, until 1993, when reliability problems with the torpedo had been resolved. In 1994, the design was accepted and SPEARFISH entered service.

In December 1994 a contract was placed with GEC-Marconi for the SPEARFISH Main Production Order (MPO). To minimise MOD liability and risk, GEC-Marconi are responsible for the In Service Support (ISS) of the Initial Production and MPO weapons until the year 2004. The Royal Navy Armament Depot at Beith is the major sub-contractor to GEC-Marconi for this element of the contract.

The Royal Navy's requirements have been met to date using Initial Production Torpedoes and progress on the MPO is on schedule.

Significant future milestones include:

Production Verification Trials	December 1997
Delivery of the first MPO weapons	June 1999
Under Ice Trials	June 2000
Fleet Weapon Acceptance	June 2001
Transfer Project to the Naval Support Command	June 2002

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
GEC-Marconi (Underwater Weapons Division)(Development & Initial Production)	Fixed Price	Selected after comparison with US Mk48 ADCAP Torpedo.
GEC-Marconi (Underwater Weapons Division)(Main Production Order)	Predominately Fixed Price	Non- Competitive.

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development D&IP £m	Production MPO £m	Total £m
Current Estimate of Costs	1115	625	1740
Estimate of Costs at MOD Approval	928	615	1543
Difference	+187	+10	+197

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Slippage	40	-	Delays in the D&IP programme required support costs for the first torpedoes to be accounted for against project costs until the ISD has been achieved (+£40m).
Inflation	157	-	Difference in annual uplift between specific indices and the GDP deflator (+£157m).
Total	197	NIL	

Total Balance	+197

Expenditure to date (31 March 1997): D & IP, £1,110m
MPO £116m

Approval	Date	Explanation
First approval:	1982	Development & Initial Production (D&IP)
Latest approval:	1994	Main Production Order (MPO)

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£625m (MPO)
Cost Change since Main Contract Award	£10m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	10	-	Difference in annual uplift between specific indices and GDP deflator (+£10m).
Total	10	NIL	

Total Balance	+10

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m).	NIL

Unit Production Cost (UPC)	Quantities Required
IP: £1.1M	***
MPO £1.6M	***

IN-SERVICE DATES

ISD Definition: The availability of the first outload of weapons with Certified Design to a Royal Navy Submarine.

Original ISD(Month/Year)	December 1987
Actual ISD (Month/Year)	March 1994
Variation (Month(s))	+75

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Unforeseen technical difficulties	75	-	Problems with the propulsion system (+9 months). During Contract acceptance trials it became evident that the reliability requirements of the contract were not being met . Following a design audit, a Reliability Assurance Programme was implemented (+62 months). Problems during environmental trials required for safety acceptance (+4 months).
Total	75	NIL	

Total Balance	+75

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	NIL

Swiftsure & Trafalgar Class Nuclear Submarine Update (S&T Update)

Director General Responsible:
DIRECTOR GENERAL SUBMARINES (DGSM)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

Initial Phase: The Initial Phase replaces obsolescent sonar equipment and interfaces the new sonars with the new Submarine Command System (SMCS), provided separately, to achieve an important interim improvement in operational effectiveness. The ISD was successfully achieved in June 1996.

Final Phase: The Final Phase implements acoustic signature reduction measures to reduce counter detection and enhances the submarines' own sonar performance. It replaces a number of individual sonar sets with the Sonar 2076 suite and provides the associated equipment and SMCS changes. This constitutes the fully integrated Tactical Weapons System (TWS) and provides the required capability to take the submarines into the next century.

Planning of the first Final Phase refit progresses well. All equipment required is on order and delivery programmes are being finalised. Risk reduction trials are in hand. A programme to transfer the Final Phase contracts to the ASTUTE (B2TC) Prime Contractor (GEC Marconi) by novation is underway, with the aim of completing the transfer by March 1998. This will enable the contractor to gain experience on the S&T Update project thus reducing the potential for future cost growth on the ASTUTE Class submarine project.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
Submarine Command System (SMCS)	1994
D154-Nuclear Submarine Refit and Refuel Facilities at Devonport	2002
Batch 2 Trafalgar Class (B2TC)	2005

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Initial Phase GEC Marconi Naval Systems Sonar Systems Division (Sonar 2074)	Firm Price	UK Competitive
BAe SEMA	Firm Price	Non-Competitive
Final Phase Thomson Marconi Sonar (Sonar 2076)	Firm Price	UK Competitive

PROJECT COSTS SUMMARY

(At 1997/98 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	362	354	716
Estimate of Costs at MOD Approval	304	339	643
Difference	+58	+15	+73

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Inflation	15	-	Differences in annual price uplifts between specific indices and GDP deflator (+£15m).
Changed costing	7	20	Changed assessment of what is required to deliver the programme (+£2m and -£15m). Variation between MOD estimates and prices achieved following competitive tendering (+£5m and -£5m).
Changed requirement	2	-	Increase resulting from the decision to remove a submarine from extended readiness and fit with Initial Phase equipment (+£2m).
Delays in associated projects	69	-	Increase in costs as a result of changes to the submarine refit programme (+£34m). Increase in attributable costs following the disaggregation of funding for the cost of trial ranges and services (+£35m).
Total	93	20	

Total Balance	+73

Expenditure to date (31 March 1997): £306m

Approval	Date	Explanation
First approval:	1988	Full Development and Initial Production of Initial Phase following completion of Feasibility Studies for Final Phase
Latest approval:	1994	Procurement of a further 3 Initial Phase sets and Full Development & Initial Production of 4 Final Phase sets

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£189m (Final Phase of main Full Development & Initial Production contract)
Cost Change since Main Contract Award	-£5m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	-	2	Difference in annual price uplifts between specific indices and the GDP deflator (-£2m).
Changed costing	-	3	Slippage of Firm Price stage payments on the stage payment plan (-£3m).
Total	-	5	

Total Balance	-5

Year(s) of Peak Expenditure: 1996/1997 & 1997/1998

Further Expenditure in Clear Prospect: (at 1997/98 average forecast of outturn prices to the nearest £10m).

£60m (Procurement of 3 Final Phase sets in addition to the 4 already quoted under quantities required)

Unit Production Cost (UPC)	Quantities Required
Initial Phase - £4.3M	8 Boat Sets
Final Phase - £28.2M	Initial Production of 4 Boat Sets and supporting shore equipment

IN-SERVICE DATES

ISD Definition: The date by which the first Initial Phase or Final Phase Tactical Weapon System is fitted and operationally effective on a Royal Navy submarine.

	Initial Phase	Final Phase
Original ISD(Month/Year)	October 1994	December 1998
Forecast ISD (Month/Year)	June 1996	May 2003
Variation (Month(s))	+20	+53

EXPLANATION OF ISD SLIPPAGE
Initial Phase:

Factor	Increase (Months)	Decrease (Months)	Explanation
Procurement delays	12	-	Impact of period of financial constraint which delayed the placement of contracts (+12 months).
Delays in associated projects	12	2	Changes to fit opportunities resulting from changes to the Submarine Refit Programme (+12 months and -2 months).
Total	22 (1)	2	

Total Balance	+20

Note (1): A proportion of the procurement delays and delays to associated projects acted concurrently

Final Phase:

Factor	Increase (Months)	Decrease (Months)	Explanation
Procurement delays	5	-	Impact of a period of financial constraint which delayed the placement of contracts (+5 months).
Delays in associated Projects	39	-	Changes to fit opportunities resulting from changes to the Submarine Refit Programme (+39 months).
Other specified factors	9	-	Delay to start of Full Development and Initial Production as a result of the extension to Project Definition (+9 months).
Total	53	NIL	

Total Balance	+53

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/98 average forecast of outturn prices):	ISD delays may result in additional costs incurred in maintaining and repairing existing obsolescent equipment. However, there is no reliable evidence currently available to confirm the existence of any such costs or upon which to calculate their extent.

TOMAHAWK Land Attack Missile (TLAM)

Director General Responsible:
DIRECTOR GENERAL SUBMARINES (DGSM)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

The TOMAHAWK Land Attack Missile (TLAM) is a conventionally armed land attack missile, capable of launch from a submarine. Studies concluded that the only realistic option to meet the United Kingdom's requirement was to procure TOMAHAWK from the United States, the effectiveness of which had already been proven in war.

The main elements of the project are:

a) A Foreign Military Sales (FMS) case covering 65 TOMAHAWK Missiles, inert test vehicles, fire control software/hardware and a Mission Planning System.

b) A contract with Lockheed Martin Federal System for the development, integration and proving of modifications to the Submarine Tactical Weapon System to operate TOMAHAWK. There are a number of UK sub-contractors.

c) A contract with ICL-DESC covering building modifications and infrastructure to house the Mission Planning equipment (Cruise Missile Support Activity-CMSA) in the Northwood Command Centre.

The programme is on schedule and all development milestones have been met. Significant future milestones on this project include:

First inert discharges from a UK submarine	August 1997
First equipment fit to a UK submarine	October 1997 - April 1998
CMSA Technical Transfer	July 1998
First firing on United States (US) range	November 1998
Second firing on US range	November 2000
Fleet Weapon Acceptance	June 2001

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
US Department of Defense(Main Development & Production)	FMS Case subject to Exchange Rate Variation	Non Competitive
Lockheed Martin Federal Systems(Integration)	Firm Price	International Competition.
ICL-DESC(Mission Planning Command)	Firm Price	UK Competition

PROJECT COSTS SUMMARY

(At 1997/98 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	76	101	177
Estimate of Costs at MOD Approval	85	99	184
Difference	-9	+2	-7

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Accounting adjustment	1	-	Accounting adjustment due to change in revaluation factors (+£1m).
Changed requirement	4	-	Further work identified as necessary to meet approved requirement: (+£1M) added to Integration Contract (+£3M) to be added to FMS contract.
Changed costing	-	8	Contracts let for less than estimates contained in original approval. FMS contract (-£3m) and Integration Contract (-£5m).
Exchange rates	-	4	Variations in the value of Sterling against the US Dollar (-£4m).
Total	5	12	

Total Balance	-7

Expenditure to date (31 March 1997): £37m

Approval	Date	Explanation
First approval:	1994	Feasibility Study.
Latest approval:	1995	Main Development & Production

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£89m (Development & Production)
Cost Change since Main Contract Award	- £4m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Exchange rates	-	4	Variations in the value of Sterling against the US Dollar (-£4m).
Total	NIL	4	

Total Balance	-4

Year(s) of Peak Expenditure: **1997/1998 & 1998/1999**

Further Expenditure in Clear Prospect: NIL
(at 1997/98 average forecast of outturn prices to the nearest £10m).

Unit Production Cost (UPC)	Quantities Required
£0.7m	65

IN-SERVICE DATES

ISD Definition: The date when the first equipment is available for service use.

Original ISD(Month/Year)	1998 (Assumed December)
Forecast ISD (Month/Year)	1998 (Assumed December)
Variation (Month(s))	NIL

EXPLANATION OF ISD SLIPPAGE

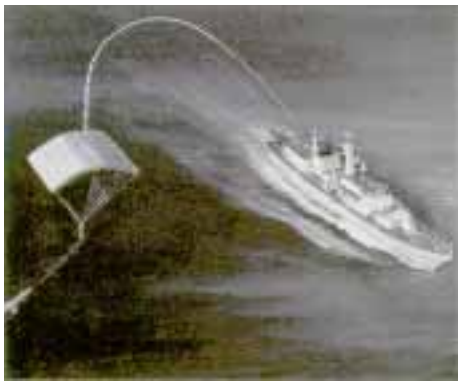
Factor	Increase (Months)	Decrease (Months)	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

COSTS OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/98 average forecast of outturn prices):	N/A

Active Decoy Round (ADR) - Outfit DLH



Director General Responsible:
DIRECTOR GENERAL SURFACE SHIPS (DGSS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

Outfit DLH is a conversion of the existing SEAGNAT Ship Control System; it provides the additional functionality to enable it to accommodate the firing of the Active Decoy Round (ADR). The ADR is rocket propelled towards the threat and, after a predetermined time, it deploys its electronic payload on a parawing. This descends slowly, continuously seeking Anti-Ship Missile(s) transmissions which it manipulates and re-transmits to achieve seduction. The current approval is for 21 ship fits, 3 shore fits and 720 rounds.

A competitive procurement route has been followed resulting in three parallel Feasibility Studies, down selecting to two parallel Project Definitions leading to the final selection of GEC Marconi, as the Prime Contractor. A contract was placed on 12 July 1994 for Development (Firm Price) and Initial Production (Fixed Price).

Future key events are: completion of the DLH integration trials at the Land Base Test Site (LBTS) to prove ship systems interfaces in December 1997, completion of the ADR flight trials in March 1998, and completion of the ship firing trials programme in December 1998. The In-Service Date of the equipment is April 2000.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
GEC - Marconi (Development & Production)	Firm and Fixed	Competitive - UK.
Dassault Electronique (Development & Production)	-	Sub-contract (Approximately 25% of total)

Expenditure to date (31 March 1997): £28m

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	38	65	103
Estimate of Costs at MOD Approval	38	63	101
Difference	NIL	+2	+2

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Inflation	4	-	Difference in annual price uplifts between specific indices and the GDP deflator (+£4m).
Changed costing	-	2	Reduction in estimates between the approval and placing the contract (-£2m).
Total	4	2	

Total Balance	+2

Expenditure to date (31 March 1997): £28m

Approval	Date	Explanation
First approval:	1988	Feasibility Study
Latest approval:	1994	Full Development/Initial Production

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£89m (Development & Production)
Cost Change since Main Contract Award	£4m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	4	-	Difference in annual price uplifts between specific indices and the GDP deflator (+£4m).
Total	4	NIL	

Total Balance	+4

Year(s) of Peak Expenditure: 1999/2000 & 2001/2002

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). £90m (Second & Third Production Buys)

Unit Production Cost (UPC)	Quantities Required
Round: £0.071m	720
Ship System: £0.236m	24

IN-SERVICE DATES

ISD Definition: When one third of the assigned ships has achieved a satisfactory assessment for DLH at Naval Weapons Sea Trial (NWST) and each of those ships has been supplied with a complete onboard outfit of decoy rounds.

Original ISD(Month/Year)	1997 (Assumed December)
Forecast ISD (Month/Year)	April 2000
Variation (Month(s))	+27

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Budgetary Constraints.	27	-	The project was deferred to match the programme to available resources (+24 months). As a result funding provision for the Full Development phase was delayed until April 1994 (+3 months).
Total	27	NIL	

Total Balance	+27

COSTS OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	NIL

Common New Generation Frigate (CNGF)

Director General Responsible:
DIRECTOR GENERAL SURFACE SHIPS (DGSS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

The Common New Generation Frigate (CNGF) is a collaborative programme between the United Kingdom, France and Italy to procure a new class of Anti-Air Warfare (AAW) warship to enter service in 2004. It will replace the UK's existing Type 42 AAW Destroyer. It comprises two distinct programmes: the Principal Anti-Air Missile System (PAAMS) and the Ship and its other systems (HORIZON), both derived from a single tripartite Staff Requirement. Memoranda of Understanding (MOU) were signed in July 1994 and March 1996.

For HORIZON, an initial design and validation phase (Phase 1) started in March 1996. This will be followed by Phase 2, the detailed design and build of three First of Class (FOC) ships (one for each nation). For PAAMS, the next major milestone will be the start of PAAMS Full Scale Engineering Development and Initial Production (FSED/IP) early in 1998, for which negotiations are underway with industry and our partner nations.

HORIZON joint costs for Development and FOC construction will be shared equally by the three nations. Subsequent Production costs will be shared on the basis of offtake. There is no predetermined workshare, and work will be competed wherever practicable and cost-effective. For PAAMS, the arrangements for cost and worksharing have not yet been agreed in their final form.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
HORIZON International Joint Venture Company (IJVC) comprising, UK: GEC Marconi Ltd, BAe, Vosper Thornycroft France: DCN International Italy: Orrizonte	Proposed Arrangements: Fixed Price	Non-competitive prime contractor with competition for sub contracts to a value yet to be determined.
PAAMS EUROPAAMS composed of UKAMS (BAe, GEC Marconi, Siemens Plessey Systems) and EUROSAM (Aerospatiale, Thomson-CSF and Alenia)	Proposed Arrangements: Fixed Price	Non-competitive prime contractor with competition for sub contracts to a value yet to be determined.

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	185	-	185
Estimate of Costs at MOD Approval	190	-	190
Difference	-5	-	-5

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Slippage	4	-	Extended timetable for HORIZON Phase 1 (+£4m).
Changed requirement	-	3	Change from national procurement strategy to international collaboration (-£3m).
Changed costing	-	6	Over-estimate of approved costs for the preliminary phase (-£6m).
Total	4	9	

Total Balance	-5

Expenditure to date (31 March 1997): £105m

HORIZON:

Approval	Date	Explanation
First approval:	1991	Initial Studies
Latest approval:	1995	HORIZON Phase 1 - Project Definition.

PAAMS:

Approval	Date	Explanation
First approval:	1990	Project Definition
Latest approval:	1995	Risk Reduction and negotiation of FSED/IP contract.

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	N/A
Cost Change since Main Contract Award	N/A

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

Year(s) of Peak Expenditure: **Further Expenditure in Clear Prospect:** **(at 1997/1998 average forecast of outturnprices to the nearest £10m).**	2004/2005 & 2005/2006
Unit Production Cost (UPC)	**Quantities Required**
***	***

IN-SERVICE DATES

ISD Definition: Completion of Part IV Trials, fit to enter full service.

Original ISD(Month/Year)	December 2002
Forecast ISD (Month/Year)	June 2004
Variation (Month(s))	+18

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Programme Adjustments	18	-	The need to synchronise the programme related to the combat system with that of the warship. In particular, the need to achieve a realistic and well developed programme for PAAMS, which is a determining factor for the warship ISD (+18 months).
Total	18	NIL	

Total Balance	+18

COSTS OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	N/A

Landing Platform Dock (Replacement) (LPD(R))

Director General Responsible:
DIRECTOR GENERAL SURFACE SHIPS (DGSS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

This project covers the replacement of the existing amphibious assault ships HMS FEARLESS and HMS INTREPID, which are over 30 years old. In 1991 Project Definition (PD) studies for the ship design and the Combat Management System were approved and these showed that the programme was unaffordable. Further PD studies were undertaken in 1993 and these identified an affordable solution without compromising key operational and safety requirements.

In 1994 approval was obtained to invite competitive bids for the detailed design and build of the warship. As a result of the complexity of the Integrated Communications System (ICS) and in order to reduce risk to the ship programme, approval was given to a contract with limited financial commitment to ensure the start of essential design work. The assumption was for the warship contract to be placed in December 1995, but it became apparent that only Vickers Shipbuilding and Engineering Ltd. (VSEL) would bid. Approval was therefore given to proceed on a single tender basis. VSEL's offer exceeded the funding available. Joint MOD/VSEL teams were formed to explore the realism of the estimates and the scope for modifying the specification to achieve cost reductions. These proved successful and approval was given to enter formal No Acceptable Price No Contract (NAPNOC) negotiations. This led to agreement on a final price and a contract for 2 ships being awarded to VSEL in July 1996. In addition approval was given to the procurement of associated specialised landing craft.

Since contract award, design and other planning work has proceeded on schedule.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
Command Support System	1998

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
VSEL (GEC Marine) (Warship Design, Build & Command System)	Fixed Price	NAPNOC
REDIFON MEL Ltd(Integrated Command System)	Fixed Price	UK Competitive

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production (1) £m	Total £m
Current Estimate of Costs	44	555	599
Estimate of Costs at MOD Approval	37	546	583
Difference	+7	+9	+16

Note (1): Production costs include the Design and Build activities for the Warship.

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Changed costing	4	1	Reassessment of the cost of the Integrated Communications System (ICS) (+£2m). Revised estimate for contingency requirements (+£2m) and reductions in the estimated cost of external contractor assistance activities (-£1m).
Changed requirement	13	-	Need to undertake additional PD studies to produce an affordable solution without significantly reducing the operational capability (+£6m). Increase in associated spares holdings following the decision to increase the readiness state of LPD(R)02 (+£7m).
Total	17	1	

Total Balance	+16

Approval	Date	Explanation
First approval:	1987	Warship and Combat System Feasibility Studies
Latest approval:	1996	Placement of a contract for the design and build of two LPD(R)s, associated specialist landing craft and approval to proceed to Full Production of the Integrated Communications System

PROJECT CONTRACT SUMMARY

Current cost of Main Contract	£459 (Warship Design + Build)
Cost change since Main Contract Award	NIL

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

Factor	Increase £m	Decrease £m	Explanation
N/A	-	-	-
Total	-	-	

Year(s) of Peak Expenditure:	1999/2000 & 2000/2001
Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m).	NIL

Unit Production Cost (UPC)	Quantities Required
LPD(R)01 - £340m (Includes non-recurring First of Class Development costs)	1
LPD(R)02 - £255m	1

IN-SERVICE DATES

ISD Definition: The dates when each vessel becomes fully operational.

	LPD(R)01 (HMS ALBION)	LPD(R)02 (HMS BULWARK)
Original ISD(Month/Year)	October 1998	December 2000
Forecast ISD (Month/Year)	March 2002	March 2003
Variation (Month(s))	+41	+27

EXPLANATION OF ISD SLIPPAGE

LPD(R)01 (HMS ALBION):

Factor	Increase (Months)	Decrease (Months)	Explanation
Need for project re-definition	14	-	The need to undertake essential Project Redefinition work to ensure the LPD(R) programme was affordable (+14 months).
Budgetary constraints	4	-	The need to match the programme to the available resources (+4 months).
Extended tendering process	12	-	The loss of competition at a late stage in the tendering process resulted in a delay, while VSEL revisited their bid to reflect the revised NAPNOC situation (+12 months).
Extended warship build programme	11	-	Information obtained from industry as part of the PD studies indicated that the original estimate for the warship build period was too short, and the MOD programme was adjusted accordingly (+8 months). Additionally, as a risk reduction measure and part of the NAPNOC contract negotiations, agreement was reached on a further extension to the build period to give VSEL further time to develop the warship design before starting fabrication (+3 months).
Total	41	NIL	

Total Balance	+41

LPD(R)02 (HMS BULWARK):

Factor	Increase (Months)	Decrease (Months)	Explanation
Budgetary constraints	18	-	The need to match the programme to the available Departmental resources (+18 months).
Extended warship build programme	9	-	Information obtained from industry as part of the PD studies indicated that the original estimate for the warship build period was too short, and the MOD programme was adjusted accordingly (+6 months). Additionally, as a risk reduction measure and part of the NAPNOC contract negotiations, agreement was reached on a further extension to the build period to give VSEL further time to develop the warship design before starting fabrication (+3 months).
Total	27	NIL	

Total Balance	+27

COSTS OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	£24m

Sonar 2087

Director General Responsible:
DIRECTOR GENERAL SURFACE SHIPS (DGSS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

Sonar 2087 will be retrofitted to Type 23 Frigates

The Sonar 2087 project was formed in 1993 after the cancellation of the 2057 and 2080 sonar projects.

Sonar 2087 is a tactical, variable depth, passive and active sonar system. It will significantly improve the Type 23 Frigates' ability to detect, classify and track nuclear and conventional submarines. It will be retro-fitted to all Type 23 Frigates during refit, replacing the current passive towed array Sonar 2031 (where fitted) and integrate with the existing bow-mounted active sonar.

Following endorsement of the Project in April 1994, parallel Feasibility Study contracts were let with three UK Prime contractors. Feasibility reports were received in April 1996 and, following six months of risk reduction work, this phase was completed in October 1996.

It is expected that two contracts for Project Definition (PD) studies will be placed with Thomson Marconi Sonar and Babcock Defence Systems in April 1997. The PD phase is scheduled to run for 18 months with delivery of the first production set due in 2002. It is expected that the Type 23 retro-fit programme will be completed in 2010.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor[1]	Contract Type	Procurement Route
Thomson Marconi Sonar. Ferranti Thomson Sonar Systems. Thomson Sintra Activities. Sous Marine.	Firm Price	Prime Contractor - UK Competitive Sub-Contractor Sub-Contractor Sub-Contractor
Babcock Defence Systems. Northrop Grumman.	Firm Price	Prime Contractor - UK Competitive Sub-Contractor
BAe SEMA.	Firm Price	Prime Contractor - UK Competitive

Note (1): Contractors relate to Feasibility Studies.

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	15	-	15
Estimate of Costs at MOD Approval	15	-	15
Difference	NIL	-	NIL

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

Expenditure to date (31 March 1997) £15m

Approval	Date	Explanation
First approval:	1994	Feasibility Study Phase
Latest approval:	1994	Feasibility Study Phase

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	N/A
Cost Change since Main Contract Award	N/A

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

Year(s) of Peak Expenditure:	Post 2006/2007
Further Expenditure in Clear Prospect:(at 1997/1998 average forecast of outturn prices to the nearest £10m).	£30m - Project Definition Phase £350m - Full Development & Production.

Unit Production Cost (UPC)	Quantities Required
£12m	16 full sea-based sets 5 shore-based part sets (Training, Reference and Integration).

IN-SERVICE DATES

ISD Definition: The date at which the equipment contributes to force effectiveness in its main role and when the first Type 23 system has been cleared for operational use.

Original ISD(Month/Year)	July 2003
Forecast ISD (Month/Year)	November 2003
Variation (Month(s))	+4

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Procurement Delay	4	-	Delays experienced in obtaining Feasibility approval delayed contract placement (+3 months).One month realism slip in Project Definition approval delayed contract (+1 month)
Total	4	NIL	

Total Balance	+4

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	N/A

CHALLENGER 2 (Including Challenger Armament) (CHARM) 3)

Director General Responsible:
DIRECTOR GENERAL LAND SYSTEMS (DGLS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

CHALLENGER 2 (CR2) Main Battle Tank (MBT) with CHARM 3 ammunition will replace the current 8 regiments of CHALLENGER 1 (CR1) MBT. The CHIEFTAIN MBT was withdrawn from operational service in February 1996 and existing CR1 MBT assets were redeployed to allow 8 regiments of MBT to continue in service.

The CHARM 1 project is linked to CR2 because, when the decision was made to order a follow-on buy of 259 CR2, the contractor was required to use the 230 CHARM guns already procured from Royal Ordnance. This programme is now complete and has been fully reported in previous MPRs. It has spent £223m against a MOD approval of £200m (at 1997/98 prices).

Following an international competition, a contract was placed in June 1991 for 127 MBTs and 13 Driver Training Tanks (DTTs) to replace CHIEFTAIN. There remained a need to upgrade the rest of the MBT fleet (CR1) and it was decided in 1994 that the most cost-effective solution was to purchase further CR2. Options in the contract were taken up in July 1994 for an additional 259 MBTs and 9 DTTs, making a total order of 386 MBT and 22 DTT. The vehicle development programmes are complete and 36 MBTs and 13 DTTs have been delivered.

A trial during October 1995 established that some early production MBTs did not fully meet the contracted level of reliability acceptable for operational service. A Production Reliability Growth Programme was negotiated with Vickers plc and the company passed the first milestone in July 1996. Results from the second trial in March 1997 were encouraging and the final trial is scheduled for September 1997. The In-Service Date is expected to be achieved in June 1998.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Vickers plc (Development & Production)	Fixed Price	International Competiton
Royal Ordnance (CHARM 3 Ammunition Follow-on-Buy)	Firm Price	Competition

PROJECT COSTS SUMMARY CHALLENGER 2 (Including CHARM 3)

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development & Production £m	Total £m
Current Estimate of Costs	2202	2202
Estimate of Costs at MOD Approval	2195	2195
Difference	+7	+7

REASONS FOR COST VARIATION CHALLENGER 2 (Including CHARM 3)

Factor	Increase £m	Decrease £m	Explanation
Inflation	22	-	Due to difference in annual price uplifts between specific indices and GDP deflator (+£22m).
Exchange rate	4	-	Increases in the contract Variation of Price (VOP) due solely to exchange rate variations across a basket of currencies (+£4m).
Changed requirement	-	2	Relaxation of CHARM 3 requirement (- £1m). Reductions in training aids (-£1m).
Changed costing	20	37	Lower contract prices achieved for Demonstration Phase Equipment (-£15m), Follow-on buy contract amendment (-£15m), and CHARM 3 Development (-£3m). CHARM 3 increase to reflect tender price (+£15m). Claims for liquidated damages (-£3m) and a reduction in price due to early payment against the follow-on buy (-£1m). Increase in the estimated cost of works services related to training aids (+£5m).
Total	46	39	

Total Balance	+7

Expenditure to date (31 March 1997): £1,187m

Approval	Date	Explanation
First approval:	1988	CHALLENGER 2 Demonstration Phase
Latest approval:	1994	CHALLENGER 2 Follow-on-Buy

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£1890m (Development & Production)
Cost Change since Main Contract Award	£1116m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	49	-	Difference in price uplifts between specific indices and GDP deflator (+£49m).
Exchange rates	20	-	Increases in the contract Variation of Price (VOP) due solely to exchange rate variations across a basket of currencies (+£20m).
Changed requirement	1053	2	Increased procurement of an additional 259 MBTs, 9 DTTs and spares for the CR2 Repair Pool (+£977m). Procurement of first tranche of CHARM 3 ammunition (+£25m); CHARM modification kits (+£6m); Advance Order Spares List (AOSL) for DTTs (+£1m); AOSL for Individual Training Organisation (ITO)/DTTs (+£2m) and tranche 2 repair pool (+£29m). Relaxation of the CHARM 3 requirement (-£1m). Reduced requirement for training aids (-£1m). Further tranche of AOSL (+£13m).
Changed costing	-	4	Claims for liquidated damages (-£3m) and a reduction in price due to early payment against the follow-on buy (-£1m).
Total	1122	6	

Total Balance	+1116

Year(s) of Peak Expenditure: 1996/1997 & 1998/1999

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturnprices to the nearest £10m). £100m (Balance of Spares Requirement)

Unit Production Cost (UPC)	Quantities Required
£3.3m Main Battle Tank	386

IN-SERVICE DATES

ISD Definition: Delivery of a proportion of ITO vehicles and one regiment's establishment.

Original ISD(Month/Year)	December 1995
Forecast ISD (Month/Year)	June 1998
Variation (Month(s))	+30 months

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Unforeseen technical difficulties	30	-	Problems with the delivery of certain essential support elements (training and publications) and with the translation of development reliability standards into production vehicles. The thirty month slip was implemented to ensure that the tank should enter service to the required reliability standard and with the necessary support package (+30 months).
Total	30	NIL	

Total Balance	+30

COSTS OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	£38m

Counter Battery Radar (COBRA)

Director General Responsible:
DIRECTOR GENERAL LAND SYSTEMS (DGLS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

Counter Battery Radar (COBRA) is a collaborative project between the United Kingdom, France and Germany for a Long Range Weapon Locating Radar. In line with other equipments deployed on the Battlefield, there is a requirement to interface with BATES (the Command, Control, and Information system for Field Artillery). The cost of BATES interfaces to COBRA have therefore been included.

Contracts for Project Definition were placed with three competing consortia in July 1986. The resulting proposals for Full Development were submitted to the three nations at the end of 1986. Extended negotiations led to the award of a Development contract, with a Maximum Price Production Option (MPPO), to EuroArt in February 1990. This is covered by a Development phase Memorandum of Understanding (MOU).

A reduction in the likely German Production requirement in June 1995 invalidated the MPPO and the contractor indicated that the Unit Production Cost (UPC) would be substantially increased. Further Development work (Cost Reduction Programme (CRP)) was negotiated to keep Production costs within the MPPO.

The principal elements of the Development programme are complete. United Kingdom Troop Trials, incorporating live firing trials, are in progress. The further Development agreed in the Cost Reduction Programme is ongoing. Final price negotiations for Production are taking place and a MOU covering the Production phase is being drafted. A submission to Ministers is planned for Autumn 1997.

COBRA is under consideration for joining the Organisation for Co-operation and Collaboration in Armament (OCCAR) after it enters the Production Phase.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
BATES Phase 2	1996

PURCHASING ARRANGEMENTS

Contractor[1]	Contract Type	Procurement Route
EuroArt (Development)	Fixed Price	Collaborative International Competition
Racal Radar Defence Systems (UK)	17%	Sub-Contractors
Lockheed Martin (USA)	26%	
Thompson CSF (France)	29%	
Siemens AG (Germany)	27%	

Note (1): The above table covers the Development and CRP workshare as specified in the COBRA Development contract, apportionment of work for the production phase is yet to be established

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	63	3	66
Estimate of Costs at MOD Approval	66	6	72
Difference	-3	-3	-6

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Inflation	-	4	Difference in annual price uplifts between specific indices and the GDP deflator (-£4m).
Exchange rate	3	-	Variations in the value of Sterling against the Deutschmark, US Dollar and French Franc since contract award (+£3m).
Changed requirement	-	8	Change in definition of programme in 1995 resulted in the equipment used to alert COBRA being addressed under a separate requirement (-£3m). Reduced requirement for communications, technical and trials support during Development (-£5m).
Changed costing	6	3	The actual contract cost for BATES Interface was £3m compared to original £6m estimate (-£3m). Further Development work aimed at reducing production costs (CRP) (+£5m) and other minor changes outside the main contract (+£1m).
Total	9	15	

Total Balance	-6

Approval	Date	Explanation
First approval:	1985	Project Definition Phase
Latest approval:	1989	Full Development Phase & Limited Production BATES Phase 2

Approval	Date	Explanation

Expenditure to date (31 March 1997) £52m

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£39m (Development)
Cost Change since Main Contract Award	+£4m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Changed costing	5	-	Further Development work aimed at reducing production costs (CRP) (+£5m).
Exchange rate	3	-	Variations in the value of Sterling against the Deutschmark, US Dollar and French Franc since contract award (+£3m).
Inflation	-	4	Difference in annual price uplifts between specific indices and the GDP deflator (-£4m).
Total	-	4	

Total Balance	+4

Year(s) of Peak Expenditure:	2000/2001 & 2001/2002
Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m).	***
Unit Production Cost (UPC)	**Quantities Required**
***	NIL (7 in clear prospect)

IN-SERVICE DATES

ISD Definition: First COBRA troop (three systems) deployed.

Original ISD(Month/Year)	December 1993
Forecast ISD (Month/Year)	May 2002
Variation (Month(s))	+101

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Other specified factors	23	-	The first MOD approval was for the PD phase, with an estimated ISD of 1993. This date was reassessed at the end of the phase (+23 months).
Procurement delays 1	36	-	Protracted negotiations between the three nations and the four companies (forming EuroArt) prior to the placement of the development contract (+36 months).
Procurement delays 2	42	-	A reduction in the number of Radars required by Germany led to the need to plan, negotiate and agree the Cost Reduction Programme with EuroArt as well as obtaining national approvals (+42 months).
Total	101	NIL	

Total Balance	+101

COST OF ISD SLIPPAGE	
Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	Estimated saving of £0.9m

Truck Utility Light/Medium/Medium (Heavy Duty) (TUL/TUM/TUM(HD)

Director General Responsible:
DIRECTOR GENERAL LAND SYSTEMS (DGLS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

TUL/TUM/TUM(HD) is a range of four-wheel drive utility vehicles, used in command, front line and support roles. TUL and TUM are illustrated above.

Bids were received in 1992 from Land Rover, Iveco Ford and Steyr Daimler Puch. Iveco Ford were excluded through not meeting the technical requirement. Steyr Daimler Puch were selected for trial of the TUM(HD) element but excluded from TUL/TUM on cost grounds. Land Rover were selected for trial for all three variants.

The Land Rover trials were suspended to allow for a rectification programme. In December 1993, Steyr Daimler Puch successfully completed trials for TUM(HD). This element was split from TUL/TUM to secure timely placement of a contract. A contract for 394 vehicles was placed in June 1994. Following identification of a further requirement for the Joint Rapid Deployment Force (JRDF), an additional 65 TUM(HD) were ordered in February 1996. A requirement for a further 7 waterproofed TUM(HD) vehicles for the Royal Marines was identified and they were added to the contract in 1997.

Following completion of TUL/TUM trials in June 1995, approval to procure 7,925 vehicles from Land Rover was given in January 1996 and a contract was placed in February 1996.

Following deliveries of the first TUMs, a braking problem was identified which also affected TUL. Deliveries were suspended and liquidated damages claimed against Land Rover while the company rectified the fault. Deliveries recommenced in March 1997. TUM(HD) entered service in May 1995 followed by TUM in April 1997. TUL is expected to enter service in September 1997.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Land Rover (TUL/TUM)	Firm Price (first two Years) then Fixed Price	International Competition
Steyr Daimler Puch (TUM(HD))	Firm Price (Sterling)	International Competition

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	3	232	235
Estimate of Costs at MOD Approval	3	126	129
Difference	NIL	106	106

REASONS FOR COST VARIATION (TUM(HD) Element)

Factor	Increase £m	Decrease £m	Explanation
Changed requirement	12	-	Increase in quantity from 193 to 466 (+£12m).
Changed costing	10	-	The contracted UPC for the first 459 vehicles was some £29K higher than the original estimate. 7 specialised vehicles ordered in 1996/1997 had a further UPC increase of £21K (+£10m).
Total	22	NIL	

Total Balance	+22

REASONS FOR COST VARIATION (TUM(HD) Element)

Factor	Increase £m	Decrease £m	Explanation
Changed requirement	36	-	Latest approval is for 7,925 against the original approval of 6,270 vehicles (+£36m).
Changed costing	48	-	The average contracted UPC is some £6K higher than the original estimate (+£42m). 600 specialist vehicles will cost an additional £10K each for full waterproofing (+£6m).
Total	84	NIL	

Total Balance	+84

Expenditure to date (31 March 1997): **£59m**

Approval	Date	Explanation
First approval:	1991	Endorsement of requirement and trials
Latest approval:	1997	Re-endorsement of TUL/TUM in light of further delay in ISDs.

PROJECT CONTRACT SUMMARY

	TUL/TUM	TUM(HD)
Current Cost of Main Contract	£205m (Production)	£27m (Production)
Cost Change since Main Contract Award	£11m	£4m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Truck Utility Medium (Heavy Duty) (TUM(HD)):

Factor	Increase £m	Decrease £m	Explanation
Changed requirement	4	-	Increase in TUM(HD) requirement by 65 vehicles in February 1996 and a further 7 in January 1997 (+£4m).
Total	4	NIL	

Total Balance	+4

Truck Utility Light/Truck Utility Medium (TUL/TUM)

Factor	Increase £m	Decrease £m	Explanation
Changed requirement	6	-	Waterproofing of 600 vehicles at a cost of £10K each (£6m).
Changed costing	5	-	Increases in UPCs since placement of the production contract (£5m).
Total	11	NIL	

Total Balance	+11

Changed requirement	6	-	Waterproofing of 600 vehicles at a cost of £10K each (£6m).
Changed costing	5	-	Increases in UPCs since placement of the production contract (£5m).
Total	11	NIL	

Total Balance	+11

Years(s) of Peak Expenditure:	1997/1998 & 1998/1999
Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m).	NIL

Unit Production Cost (UPC)	Quantities Required
£25.1K TUL/TUM (Average over 20 variants)	7,925
£57.9K TUM(HD) (Average)	466

IN-SERVICE DATES

ISD Definition:

TUM Delivery of 50 supportable vehicles to depot.

TUL The original delivery of TUL was the same as for TUM but has now been revised to the delivery of 50 vehicles demonstrated to be fit for use to units, to reflect the need for confirmatory trials to be performed and for support packages to be in place.

TUM(HD) Entered service in May 1995 after a slippage against the ISD of 5 months.

	TUL	TUM
Original ISD(Month/Year)	December 1994	December 1994
Forecast ISD (Month/Year)	September 1997	April 1997
Variation (Month(s))	+33	+28

EXPLANATION OF ISD SLIPPAGE

Truck Utility Light (TUL):

Factor	Increase (Months)	Decrease (Months)	Explanation
Unforeseen technical difficulties	17	-	Trial vehicle failed the evaluation trials in 1993 and required a 'get well' programme (+17 months). Failure of axle component caused seven months slip to April 1997 concurrent with delay in the support package.
Procurement delays	4	-	Delay in EAC endorsement (+4 months).
Other factors	7	-	Land Rover delay in completion of support and documentation caused slippage from September 1996 to July 1997 of which three months were concurrent with completion of confirmatory trials (+7 months).
Redefinition of ISD	5	-	Redefinition of ISD from '50 in depot' to 'completion of confirmatory trials' to reflect acceptability of components not common with TUM (+5 months).
Total	33	NIL	

Total Balance	+33

Truck Utility Medium (TUM):

Factor	Increase (Months)	Decrease (Months)	Explanation
Unforeseen technical difficulties	17	-	Trial vehicle failed the evaluation trials in 1993 and required a 'get well' programme (+17 months). Failure of axle component caused 4 months slip to January 1997 concurrent with delay in the support package.
Procurement delays	4	-	Delay in EAC endorsement (+4 months).
Other factors	7	-	Land Rover delay in completion of support and documentation caused slippage from September 1996 to April 1997 (+7 months).
Total	28	NIL	

Total Balance	+28

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	£23m

EUROFIGHTER

Director General Responsible:
DIRECTOR GENERAL AIRCRAFT SYSTEMS 1 (DGAS1)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

EUROFIGHTER will be an agile fighter aircraft. Air superiority is the primary design driver, but the aircraft will also have an air-to-ground capability. EUROFIGHTER will thus be able to offer operational flexibility in response to the uncertain demands of the post-Cold War strategic environment, and will enable the RAF to replace the TORNADO F3 and JAGUAR aircraft. An all EUROFIGHTER fleet is substantially more cost-effective than any alternative aircraft option or aircraft mix when this multi-role capability is considered alongside costs. It is being developed in a collaborative project with Germany, Italy and Spain, and is managed on behalf of the nations by a NATO agency, NETMA. All seven development aircraft are now flying, five powered by the Eurojet EJ200 engines.

On 17 March 1997, the Chief Secretary to the Treasury gave approval for the Production and initial support of 232 Aircraft. The Memoranda of Understanding (MOU) for these phases have been drafted and await signature and we continue to encourage our partners to complete their national approval processes to allow this to occur as soon as possible. Contracts will be placed for Production Investment/Production and some areas of Support after MOU signature. The strategy for long-term support is being reviewed by joint MOD/industry working groups to ensure the most cost-effective balance of work between industry and the Royal Air Force. Proposals will be put to Ministers in autumn 1997.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
ASRAAM	1998

PURCHASING ARRANGEMENTS - Development Phase

Contractor	Contract Type	Procurement Route
Eurofighter GmbH Airframe consortium comprising: Alenia BAe CASA DASA	Fixed Price for Airframe and Target Cost Incentive Arrangement for Aircraft Equipment	Non-competitive but with international sub-contract competitive elements, the value of which amounts to some 30% of overall value of the prime contract.
Eurojet GmbH Engine consortium comprising: FIAT ITP MTU Rolls Royce	Fixed Price	Non-competitive but with international sub-contract competitive elements, the value of which amounts to some 10% of overall value of the prime contract.

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	4382	9785	14167
Estimate of Costs at MOD Approval	2988	9690	12678
Difference	+1394	+95	+1489

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Changed requirement (Development)	225	-	Provision for integration of new weapons and sensors not contained within original approval (includes Conventionally Armed Stand-Off Missile (CASOM), Advance Anti-Armour Weapon (AAAW), Low Level Laser-Guided Bomb (LLLGB), Thermal Imaging Airborne Laser Designator (TIALD)) (+£225m).
Changed costing (Development)	975	-	Changes in accounting rules (inclusion of intramural costs) (+£215M); German withdrawal from certain equipments (+£100m); higher than expected Development costs, notably for equipments (+£297m); Reorientation Development Assurance Programme (DAP) to bridge gap between Development and Production Investment (+£26m), extension of the Integrated Logistic Support (ILS) programme (+£43m), Eurofighter/Eurojet GmbH management costs (+£28m), contract price increases (+£82m), risk provision (+£184m).
Inflation	289	-	Difference in annual price uplift between specific indices and GDP deflator for Development (+£194m). Estimate of future inflation within the Aerospace industry for the Production of 232 Aircraft (+£95m).
Total	1489	NIL	

Total Balance	+1489

Expenditure to date (31 March 1997): £2,688m

Approval	Date	Explanation
First approval:	1984	Feasibility Study
Latest approval:	1997	Production Investment/Production/First Support Contract

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£1,422m (Airframe Development)
Cost Change since Main Contract Award	+ £22m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	22	-	Difference in annual price uplifts between specific indices and GDP deflator (+£22m).
Total	22	NIL	

Total Balance	+22

Year(s) of Peak Expenditure: 2002/2003 & 2003/2004

Further Expenditure in Clear Prospect:
(at 1997/1998 average forecast of outturnprices to the nearest £10m). £1,520m (Integrated Logistic Support (ILS))

Unit Production Cost (UPC)	Quantities Required
£40.2m	232

IN-SERVICE DATES

ISD Definition: Date of delivery of first aircraft to the Royal Air Force.

Original ISD(Month/Year)	December 1998
Forecast ISD (Month/Year)	December 2001
Variation (Month(s))	+ 36

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Procurement delay	16	-	Reorientation of the Development phase in response to the changed strategic environment and budgetary pressures of the four nations (+16 months).
Technical difficulties	20	-	Resulting from the application of complex technologies required to enable the equipment to meet the original Staff Requirement (+20 months).
Total	36	NIL	

Total Balance	+36

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	£101m

TORNADO GR1
Mid-Life Update (MLU)

Director General Responsible:
DIRECTOR GENERAL AIRCRAFT SYSTEMS 1 (DGAS 1)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

The TORNADO GR1 Mid Life Update (MLU) programme will enhance the capabilities of the TORNADO aircraft to find and successfully attack its targets in all weathers, and to reduce its vulnerability to counter attack. The updated aircraft will be designated TORNADO GR4.

Following substantial slippage to the ISD, and significant cost growth, the Department reviewed the MLU programme and concluded that a reduced scope programme, designated MLU93, represented a more cost effective way forward. This preserves the essential features of the full MLU programme and strikes a balance between capability, quantity and affordability. MLU93 was endorsed in July 1994, following which contracts for Development and Production planning were placed via the TORNADO Tri-National arrangements, with a Production contract being let nationally with British Aerospace (BAe).

The project is proceeding to time and cost in line with the MLU93 approval, save for a price change due to inflation and exchange rate variations. Of the 142 aircraft due to be upgraded, 8 are now in work at BAe. The first aircraft is due to be delivered to the Royal Air Force on 31 October 1997 for acceptance testing and engineering evaluation. The initial Military Aircraft Release will be issued on 31 March 1998. Full functionality is expected to be achieved in September 1998 following a final software upgrade to the aircraft. The programme is due to be complete by the end of 2002.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
Forward Looking Infra Red (FLIR)	1991
Night Vision Goggles	1993
Thermal Imaging Laser Designator (TIALD)	1993
Defensive Aids Sub-System	1994

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
PANAVIA (Development/ Production Investment) Consortium comprising: BAe, DASA, Alenia.	Firm Price	Prime Contract non-competitive, but with international competition for sub-contracts.
BAe (Production)	Fixed Price	Prime Contract under NAPNOC conditions for production of modification-kits and for their embodiment. Competition for sub-contracts amounts to 30% of the total.

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	403	543	946
Estimate of Costs at MOD Approval	166	411	577
Difference	+237	+132	+369

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Changed requirement (Quantity)	-	109	The original programme assumed 161 aircraft would be updated. This gave rise to affordability problems. Because of losses during Operation GRANBY, the update of 161 aircraft would have required older (first production batch) TORNADO aircraft to have been brought to an acceptable standard prior to modification. The requirement was therefore reduced to 142 aircraft (-£109m).
Changed requirement (Specification)	86	-	Some tasks were originally excluded from the MLU specification as they could not be adequately defined at the time. In particular, additional Government Furnished Equipment, additions to the operational requirement (TIALD and a Digital Processing & Preparation Station) and additional trials support required as a result of the cancellation of the eighth production batch aircraft (+£86m).
Changed costing	320	15	Cancellation of the eighth Production Batch resulted in additional design work falling to the Development contract. Additionally, the technical complexity of the programme was underestimated (+£320m). There has been a reduction in risk contingency, reflecting good progress on the project (-£15m).
Inflation	58	-	The difference in annual price uplifts between specific indices and the GDP deflator (+£58m).
Exchange Rate	29	-	Variations in the value of Sterling against the Deutschmark and Italian Lira (+£29m).
Total	493	124	

Total Balance	+369

Expenditure to date (31 March 1997): £460m

Approval	Date	Explanation
First approval:	1984	Feasibility Study
Latest approval:	1994	Re-approval of Development and Full Production

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£862m (Development & Full Production)
Cost Change since Main Contract Award	£72m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Changed Costing	-	15	There has been a reduction in risk contingency, reflecting good progress on the project (-£15m).
Inflation	58	-	The difference in annual price uplifts between specific indices and the GDP deflator (+£58m).
Exchange Rate	29	-	Variations in the value of Sterling against the Deutschmark and Italian Lira (+£29m).
Total	87	15	

Total Balance	+72

Year(s) of Peak Expenditure: 1997/1998 & 1998/1999

Further Expenditure in Clear Prospect: NIL
(at 1997/1998 average forecast of outturn prices to the nearest £10m).

Unit Production Cost (UPC)	Quantities Required
£3.8m	142

IN-SERVICE DATES

ISD Definition: Delivery of First Aircraft.

Original ISD(Month/Year)	1993 (Assumed June)
Forecast ISD (Month/Year)	September 1998
Variation (Month(s))	+63

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Unforeseen technical difficulties	24	-	Technical difficulties and additional time taken in competitive tendering for MLU equipments (+24 months)
Project re-definition	11	-	The need to redefine the original programme (+11 months).
Procurement delays	28	-	Significant time was lost due to funding constraints, the need to seek reapproval because of cost escalation and the resultant need for project redefinition (+28 months).
Total	63	NIL	

Total	+63

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	NIL

HERCULES C-130J

Director General Responsible:
DIRECTOR GENERAL AIRCRAFT SYSTEMS 2 (DGAS2)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

The existing Royal Air Force HERCULES transport fleet is nearly 30 years old. Aircraft availability is declining and maintenance costs are rising. The decision was therefore taken to replace part of the fleet, which is nearing the end of its operationally useful life. A Fixed Price contract was placed with Lockheed Martin on 3 March 1995 for an off the shelf purchase that covers; 25 C-130J aircraft, a suite of Synthetic Training Equipment (STE) and a comprehensive Contractor Run Interim Logistic Support (CRILS) package. The aircraft flight test and Development programme has been delayed significantly due to unforeseen flight characteristics exposed during testing. Further delays to the Royal Air Force specific software design and test programme are also expected. As a result of these delays, Lockheed Martin is unable to deliver the first 2 aircraft for test and evaluation until around the turn of 1997. As a result, there will be a delay to the delivery of aircraft to the Royal Air Force. The ISD is likely to slip by around 6 months to early 1999.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Lockheed Martin Aeronautical Systems, USA(Development & Production)	Fixed	International Competition

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development & Production £m	Total £m
Current Estimate of Costs	***	***
Estimate of Costs at MOD Approval	***	***
Difference	+49	+49

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Inflation	81	-	The difference in annual price uplift between specific indices and the GDP deflator (+£81m).
Exchange rate	-	29	Variation in the value of Sterling against the US Dollar (-£29m).
Changed costing	4	2	Increased provision for support spares and other minor items (+£4m) offset by reduction in Development costings (-£2m).
Changed requirement	5	-	Additional requirement for 8.33KHz Channel Spacing in VHF radio (+£5m).
Slippage	-	10	Reduction in contract price to reflect reduced financing charges and revised funding profile (-£8m). Delay in commencement of Support period and other activities (-£2m).
Total	90	41	

Total Balance	+49

Expenditure to date (31 March 1997): £109m

Approval	Date	Explanation
First approval:	1994	Development & Production Package
Latest approval:	1994	Development & Production Package

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	***
Cost Change since Main Contract Award	+£44m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	76	-	Difference in annual price uplift between specific indices and the GDP deflator (+£76m).
Exchange Rate	-	27	Variations in the value of Sterling against the US Dollar (-£27m).
Changed Costing	5	-	Items added to contract from within overall project cost estimate (+£5m).
Slippage	-	10	Reduced financing charges due to revised funding profile and delay in commencement of support period (-£10m).
Total	81	37	

Total Balance	+44

Year(s) of Peak Expenditure:	1998/1999 & 1999/2000
Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m).	NIL

Unit Production Cost (UPC)	Quantities Required
***	25

IN-SERVICE DATES

ISD Definition: Delivery of first twelve aircraft off contract.

Original ISD(Month/Year)	July 1998
Forecast ISD (Month/Year)	July 1998
Variation (Month(s))	NIL

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	N/A

Replacement Maritime Patrol Aircraft (RMPA) (NIMROD 2000)

Director General responsible:
DIRECTOR GENERAL AIRCRAFT SYSTEMS 2 (DGAS 2)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

In July 1996 the then Secretary of State announced the result of an international competition for the provision of a Replacement Maritime Patrol Aircraft to supersede the NIMROD MR Mk2. British Aerospace (BAe) was selected as the prime contractor to supply a complete package of 21 mission equipped NIMROD 2000 aircraft together with a training system and initial Logistic Support. A Fixed Price contract was awarded in December 1996.

Existing NIMROD MR Mk2 aircraft fuselage and structure will be relifed and reassembled with new wings and current technology engines. Air Vehicle Systems will be replaced or refurbished and the mission system will be entirely new. The cabin interior will be refitted to reflect the reduced crew complement, facilitated by automated flight and missions systems. A comprehensive suite of Synthetic Training Equipment (STE) will be provided (including dynamic simulators and rear crew trainers). Sub-contractors include Boeing (Tactical Command System and Sensors), FR Aviation (Structural Relife), Rolls Royce/BMW (Engines), Racal (Radar) and Thomson Training and Simulation Ltd (Synthetic Training Aids).

The first three airframes (ex-long term storage) have been air freighted to FR Aviation. The air vehicle preliminary design review is currently programmed for February 1998 and first flight is scheduled to occur late in 1999.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
British Aerospace Defence Ltd Military Aircraft Division	Fixed Price	Prime contractor International competition
Boeing Defence & Aerospace Group, USA (Tactical Command System and Sensors)	-	Sub-contract

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development and Production £m	Total £m
Current Estimate of Costs	2305	2305
Estimate of Costs at MOD Approval	2268	2268
Difference	+37	+37

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Changed costing	1	1	Increase in cost owing to the creation of trading fund for the Communications Electronics Security Group (CESG) after original approval had been granted (£1m). Reduction owing to a reassessment of Feasibility and Project Definition costs (-£1m).
Inflation	37	-	Difference in annual price uplift between specific indices and GDP deflator (+£37m).
Total	38	1	

Total Balance	+37

Expenditure to date (31 March 1997): £79m

Approval	Date	Explanation
First approval:	1992	Release to industry of Request For Information (RFI)
Latest approval:	1996	Procurement of 21 NIMROD 2000 aircraft including Rolls Royce/BMW Engines and Racal Radar together with an associated package of Synthetic Training and initial Logistic Support.

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£2,026m (Development & Production)
Cost Change since Main Contract Award	+£35m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	35	-	Difference in annual price uplift between specific indices and GDP deflator (+£35m).
Total	35	NIL	

Total Balance	+35

Years of Peak Expenditure: 2002/2003 & 2003/2004

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). NIL

Unit Production Cost (UPC)	Quantities Required
Not available - Development & Production package.	21

IN-SERVICE DATES

ISD Definition: Delivery of seventh production standard aircraft to the Royal Air Force.

Original ISD (Month/Year)	2000 (Assumed December)
Forecast ISD (Month/Year)	April 2003
Variation (Month(s))	+28

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Redefinition of Programme	21	-	Original ISD was determined by expected equipment obsolescence. Subsequent responses to Request for Information (RFI) from industry indicated that the earliest ISD industry could achieve was September 2002 (+21 months).
Outcome of Competition	7	-	Earliest date offered in outcome of tender competition (+7 months).
Total	28	NIL	

Total Balance	+28

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	NIL[1]

Note (1): The assumption contained within the original approval was that retaining the existing NIMROD fleet in service beyond 2005 would require significant cost of ownership increases. The current ISD of 2003 has not therefore resulted in any additional running costs.

Attack Helicopter - WAH-64 APACHE

Director General Responsible:
DIRECTOR GENERAL AIRCRAFT SYSTEMS 2 (DGAS2)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

The WAH-64 APACHE Attack Helicopter is a version of the United States Army's AH-64D (illustrated above). It will be equipped with the latest technology LONGBOW Millimetric Fire Control Radar and with both Semi-Active Laser and Radio Frequency versions of the HELLFIRE Missile. The United Kingdom's APACHE will be powered by Rolls Royce Turbomeca RTM 322 engines and will also be armed with the CRV-7 Ground Suppression Rocket System.

The procurement strategy was based on an off the shelf buy of the complete weapons system through a prime contractor. Following a competition, a prime contract for the supply of 67 Attack Helicopters and the integration of their weapons was placed with GKN-Westland Helicopters Ltd (GWHL) on 25 March 1996. McDonnell Douglas Helicopter Systems is the major US sub-contractor to GWHL. Several other equipments have yet to be added to the contract, for example, defensive aids and communications. A separate contract for the procurement of the APACHE munitions was placed with Hunting Engineering on 29 March 1996. A contract for an Air-to-Air Missile (AAM) will be placed after selection of an appropriate weapon. Training equipment was omitted from the prime contract and a Private Finance Initiative (PFI) training package is now being pursued with GWHL. The first aircraft will be delivered in March 2000 and all deliveries will be completed by December 2003.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
GKN-Westland Helicopters Ltd. (Production)	Fixed Price	International Competition
McDonnell Douglas Helicopter Systems, USA	-	Sub contractor

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	2	2756	2758
Estimate of Costs at MOD Approval	3	2797	2800
Difference	-1	-41	-42

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Inflation	17	-	Difference in annual price uplift between specific indices and the GDP deflator (+£17m).
Exchange rate	6	18	Variation in the value of Sterling against the US Dollar resulted in a decrease in cost against the main production contract (-£18m). A further variation has increased the estimated cost of the missile to be procured separately (+£2m). Increase in the contract Variation of Price (VOP) due to exchange rate variation against the French Franc (+£4m).
Change requirements	-	80	Reduction of Air-to-Air Missile (AAM) quantity (-£9m).Deletion of Direct Fire Weapon Effects Simulator (DFWES) requirement and expected adoption of a US solution for Integrated Helmet (-£71m).
Changed costing	52	19	Outcome of tendering and contractual negotiations (+£52m). Reassessment of costs to support tender assessment (-£1m). Changed assessment of cost of production items yet to be contracted (-£6m). Reassessment of cost estimate based upon approved contract profile (-£12m).
Total	75	117	

Total Balance	-42

Expenditure to date (31 March 1997): £157m

Approval	Date	Explanation
First approval:	1991	Tender/assessment phase
Latest approval:	1996	Production of 67 WAH-64 APACHE Attack Helicopters

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£2,053m (Production)
Cost Change since Main Contract Award	NIL

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	14	-	Difference in the annual price uplift between specific indices and the GDP deflator (+£14m).
Exchange rate	4	18	Variation in the value of Sterling against the US Dollar on the main Production contract (-£18m). Increase in the contract Variation of Price (VOP) due to exchange rate variation against the French Franc (+£4m).
Total	18	18	

Total Balance	NIL

Year(s) of Peak Expenditure: 1999/2000 & 2000/2001

Further Expenditure in clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). NIL

Unit Production Cost (UPC)	Quantities Required
£21.8m	67

IN-SERVICE DATES

ISD Definition: Delivery of the first 9 production standard WAH-64 APACHE Attack Helicopters.

Original ISD(Month/Year)	December 1999
Forecast ISD (Month/Year)	December 2000
Variation (Month(s))	+12

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Budgetary constraints	12	-	The programme has been slipped twice by 6 months in order to match the programme to the available Departmental resources (+12 months).
Total	12	NIL	

Total Balance	+12

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	N/A

CHINOOK Medium Support Helicopter

Director General Responsible:
DIRECTOR GENERAL AIRCRAFT SYSTEMS 2 (DGAS2)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

On 9 March 1995, the then Secretary of State announced the result of the Medium Support Helicopter (MSH) competition. 22 MERLIN HC Mk3 Support Helicopters (SH) and 14 CHINOOK Medium Support Helicopters were to be purchased. The approval for CHINOOK also included the necessary modification work to incorporate future associated projects and an Initial Spares purchase. The contract(s) for Initial Spares purchases will be let once the requirement is defined.

An extant requirement to modify 8 CHINOOK helicopters to fit Extended Range Fuel Tanks and provide fixed fittings for Air-to-Air Refuelling (AAR) capability was the subject of a separate approval. It was subsequently found that it would be more efficient to incorporate this requirement within the new build CHINOOKS.

Both approvals were obtained on the basis of Fixed Price estimates, although the Boeing contract, after negotiation, was placed as Firm Price. The contract for the manufacture and supply of 14 CHINOOK Helicopters, including 8 fitted with the extra requirement, was signed on 31 July 1995.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Boeing Defense & Space Group, Helicopters Division, USA.	Firm Price	Parallel NAPNOC Negotiations with GKN Westland (MERLIN HC Mk3).

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	-	308	308
Estimate of Costs at MOD Approval	-	326	326
Difference	-	-18	-18

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Exchange rate	-	9	Variation in the value of Sterling against the US Dollar (-£9m).
Changed requirement	15	1	Reduction in the Integrated Logistic Support (ILS) content of the contract (-£1m). Increased cost of extended range fuel tanks and fixed fittings for AAR Capability approved separately (+£15m).
Changed costing	13	37	Increased cost of CHINOOK engine (+£3m). Reassessment of cost of initial spares buy (+£10m). Reduction in cost for Helicopter Health and Usage Monitoring System and Navigation Update equipment both now to be procured separately (-£19m). Change from fixed price approval to firm price contract (-£18m).
Slippage	1	-	Advancement of Firm Price payment profile to meet early achievement of milestones (+£1m).
Total	29	47	

Total Balance	-18

Expenditure to date (31 March 1997): £113m

Approval	Date	Explanation
First approval:	March 1995	Production contract for 14 CHINOOK Helicopters.
Latest approval:	June 1995	To incorporate Extended Range Fuel Tanks and AAR Capability.

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£252m (Production)
Cost Change since Main Contract Award	-£5m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Exchange rate	-	8	Variation in the value of Sterling against the US Dollar (-£8m).
Slippage	1	-	Advancement of Firm Price payment profile to meet early achievement of milestones (+£1m).
Changed costing	3	-	Increased cost of CHINOOK engine (+£3m).
Changed requirement	-	1	Reduction in Integrated Logistic Support (ILS) content of contract (-£1m).
Total	4	9	

Total Balance	-5

Year(s) of Peak Expenditure:	1996/1997 & 1997/1998
Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m)	£10m per year throughout the LTC period (PFI Training Package).

Unit Production Cost (UPC)	Quantities Required
***	6
***	8

IN-SERVICE DATES

ISD Definition: Delivery of first Chinook Helicopter to the Royal Air Force.

Original ISD(Month/Year)	December 1997
Forecast ISD (Month/Year)	December 1997
Variation (Month(s))	NIL

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices)	N/A

MERLIN HM MK1 Helicopter

Director General Responsible:
DIRECTOR GENERAL AIRCRAFT SYSTEMS 2 (DGAS2)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

MERLIN HM MK1 (formerly MERLIN EH101) is an Anti-Submarine Warfare (ASW) variant of the EH101 helicopter. It is due to enter service in 1998 replacing the SEA KING ASW. The collaborative programme began in 1979 through EH Industries - the company formed by Agusta of Italy and GKN Westland in the UK. It is the largest collaborative helicopter project in history and the most powerful helicopter yet designed in Western Europe. The mission system is world leading and the weapons system is a significant force multiplier. Development and qualification flying is about 85% complete.

In 1990 the United Kingdom selected IBM-ASIC (subsequently Loral-ASIC, now Lockheed Martin ASIC (LMA)) as prime contractor to complete Royal Navy development, integration of the Mission System and Production of 44 aircraft. Since then progress has been made on the programme through the award of the Collaborative Production Investment contract in March 1992, the MERLIN Training System in July 1994, and the MERLIN Support and Spares Availability System (MSSAS) in July 1996.

Progress on the project has been hampered by accidents to 3 prototype aircraft in 1993, 1995 and 1996. However the first flight by a production MERLIN was on 6 December 1995 and the first mission system fitted MERLIN flew in January 1997. The delivery of the fourth aircraft to the Royal Navy for Military Aircraft Release Trials is due in November 1997. The logistic support arrangements will be in place by September 1998 and Intensive Flight Trials are due to commence in November 1998.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
EH Industries Ltd (Collaborative Development EH101)	Target Cost + Incentive Fee with a Maximum Price.	Non-competitive with no competition for sub-contracts. Reflects 50/50 workshare agreement between Westland and Agusta
GKN Westland Helicopters Ltd (Aircraft Development & Production)	-	Workshare agreement Principal EHI sub-contractor
EH Industries Ltd (Production investment EH101)	Target Cost Incentive Fee	Non-competitive, with no competition for sub-contracts

Lockheed Martin ASIC (Completion of specific Development, Integration of mission systems and aircraft Production)	Fixed Price	International Competition
Lockheed Martin ASIC (Development & Production, MERLIN Training System)	Fixed Price	Non-competitive
Lockheed Martin ASIC (MERLIN Support and Spares Availability System (MSSAS))	Fixed Price	Non-competitive

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	**Development and Production £m**	**Total £m**
Current Estimate of Costs	4446	4446
Estimate of Costs at MOD Approval	3686	3686
Difference	+760	+760

REASONS FOR COST VARIATION

Factor	**Increase £m**	**Decrease £m**	**Explanation**
Changed costing	595	109	Over optimism in the collaborative Development programme, specific technical problems, the loss of Pre-Production aircraft No 2 and substantial restructuring of the Development programme caused by accidents to Pre-Production Aircraft No 4 and No7 (+£356m). Accidents to Pre-Production Aircraft No 4 (+£30m) and No 7 (+£75m). Reassessment of the expected cost of the MERLIN Prime Contract (+£32m) and the MERLIN Training System contract (+£76m). The introduction of funding (previously intramural) for Defence Test and Evaluation Organisation (DTEO) work (+£24m) and Communications Electronics and Security Group (CESG) work (+£2m). Reassessment of costs and contract negotiations across the project (-£109m).
Changed Requirement	56	-	Procurement of safety enhancements: specialised Emergency Lighting (+£10m) and the purchase and integration of an Accident Data Recorder (+£9m). Additional funding for Aircraft Special Servicing Equipment and Ground Support Equipment (+£6m) and MERLIN Support and Spares Availability System (MSSAS) (+£31m).
Inflation	218	-	Difference in annual price uplift between specific indices and the GDP deflator (+£218m).
Total	869	109	

Total Balance	+760

Expenditure to date (31 March 1997): £2,901m

Approval	Date	Explanation
First approval:	1975	Feasibility
Latest approval:	1996	Financial re-approval of Development and Production Package

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£2,222m (MERLIN Prime Contract)
Cost Change since Main Contract Award	+£145m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Changed costing	44	29	Reassessment of the cost of the MERLIN Prime Contract resulting from contract negotiations (+£32m). Additional cost from the loss of Pre-Production aircraft No 4 (+£12m). Pricing negotiations with sub-contractors (-£29m).
Changed requirement	19	-	Procurement of safety enhancements: specialised Emergency Lighting (£10m) and the purchase and integration of Accident Data Recorder (£9m).
Inflation	111	-	Difference in annual price uplifts between specific indices and the GDP deflator (+£111m)
Total	174	29	

Total Balance	+145

Years of Peak Expenditure: 1995/1996 & 1997/1998

Further Expenditure in clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). NIL

Unit Production Cost (UPC)	Quantities Required
Not available (Development and Production Package)	44

IN-SERVICE DATES

ISD Definition: The date by which the twelfth helicopter is delivered to the Royal Navy.

Original ISD(Month/Year)	December 1993
Forecast ISD (Month/Year)	March 1999
Variation (Month(s))	+63

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Unforeseen technical difficulties	32	-	Technical problems in the early stages of the collaborative programme, the integration of the Automatic Flight Control System and the engine proving more complex than originally expected (+29months). The accident to Pre-Production Aircraft No 7 (+3 months).
Need for project redefinition	24	-	Restructuring the collaborative Development programme and the competition to select a Prime Contractor (+24 months).
Redefinition of ISD	-	5	Redefinition of the ISD from 17 to 12 Aircraft. The National Audit Office has agreed to reflect this as an ISD variation decrease (-5 months).
Budgetary constraints	12	-	The need to match the programme to the available Departmental resources (+12 months).
Total	68	5	

Total Balance	+63

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	£150m[1]

Note (1): This figure represents the costs of running on SEA KING helicopters and is not a net cost.

MERLIN HC MK 3 Helicopter

Director General Responsible:
DIRECTOR GENERAL AIRCRAFT SYSTEMS 2 (DGAS 2)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

The MERLIN HC Mk 3 Helicopter (previously known as the EH101 Support Helicopter) is based on the Utility version of the Anglo-Italian EH101 Helicopter. It is designed to carry 24 troops or a range of vehicles internally or as underslung loads.

A Fixed-Price contract for 22 MERLIN HC Mk 3 Helicopters was signed on 9 June 1995 with GKN Westland Helicopters Ltd (GWHL). This followed parallel No Acceptable Price No Contract (NAPNOC) competition between GWHL and Boeing Helicopters (bidding the CHINOOK) for the Royal Air Force's Medium Support Helicopter requirement.

The first two years of the contract have seen good progress. However, the ISD has slipped three months due to delay in the Anglo-Italian Development programme following the loss of Pre-Production EH101 No. 4 in an accident in 1995.

The Critical Design Review will take place in July 1997. A contract for Initial Provisioning spares for the helicopter is expected to be placed later this year.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
MERLIN HM Mk 1 Helicopter	1999

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
GKN Westland Helicopters Ltd (Development & Production)	Fixed Price	Parallel NAPNOC negotiations with Boeing Helicopters Division, USA.

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development & Production £m	Total £m
Current Estimate of Costs	756	756
Estimate of Costs at MOD Approval	726	726
Difference	+30	+30

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Inflation	19	-	Difference in annual price uplifts between specific indices and GDP deflator (+£19m).
Changed requirement	3	-	Revised specification to accommodate safety and airworthiness features covered by the Staff Requirement, but not in the original contract (+£3m).
Exchange rate	3	-	Variation in the value of Sterling against the French Franc. The aircraft's engine is jointly manufactured by Rolls Royce and Turbomeca (France) (+£3m).
Changed costing	43	38	Omission from EAC submission of Spares Packaging (+£5m) and Ground Support Equipment (+£11m). Underestimation of costs of Directable Infra-Red Counter Measures (DIRCM) (+£12m). Cost of trials at the Directorate of Test and Evaluation Organisation (DTEO), previously intra-mural, (+£15m). Reduction in estimate of Continuing Design Services (-£7m), Risk provision (-£12m), contractor's trials (-£1m) and DTEO provision (-£2m). Reassesment of resources required to meet spares requirement (-£16m).
Total	68	38	

Total Balance	+30

Expenditure to date (31 March 1997): £125m

Approval	Date	Explanation
First approval:	1995	Development and Production Package
Latest approval:	1995	Development and Production Package

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£537m (Development & Production)
Cost Change since Main Contract Award	+£18m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Changed requirement	3	-	Revised specification to accommodate safety and airworthiness features covered by the requirement, but not in the original contract (+£3m).
Inflation	12	-	Difference in annual price uplift between specific indices and GDP deflator (+£12m).
Exchange rate	3	-	Variation in the value of Sterling against the French Franc. The aircraft's engine is jointly manufactured by Rolls Royce and Turbomeca (France) (+£3m).
Total	18	NIL	

Total Balance	+18

Years of Peak Expenditure:	1999/2000 & 2000/2001
Further Expenditure in clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m).	£10m per year throughout the LTC period (PFI Training Package).

Unit Production Cost (UPC)	Quantities Required
Not available (Development & Production Package)	22

IN-SERVICE DATES

ISD Definition: Delivery of 6 aircraft to the Royal Air Force.

Original ISD (Month/Year)	December 1999
Forecast ISD (Month/Year)	March 2000
Variation (Month(s))	+3

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Technical difficulties	3	-	Delay in the EH101 Development programme caused by loss of Pre-Production aircraft No.4 in 1995 (+3 months).
Total	3	NIL	

Total Balance	+3

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	N/A

BOWMAN

Director General Responsible:
DIRECTOR GENERAL COMMAND INFORMATION SYSTEMS (DGCIS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

BOWMAN will provide the armed forces with a combat radio system to replace CLANSMAN, which has been in service since the mid 1970's and is now becoming increasingly obsolescent.

Feasibility Studies were split into two stages, with the first Feasibility stage (FS1) completed in August 1993. Following international competition in 1993, contracts were placed with two competing consortia; YEOMAN (Siemens Plessey Systems Ltd and Racal) and CROSSBOW (led by ITT Defence (UK) Ltd) for Feasibility Stage 2 (FS2) and the first Project Definition stage (PD1). These phases are now drawing to a close.

The second Feasibility Study indicated that the risk of procuring and integrating the communications harness for BOWMAN, known as the Vehicle Integrated Communications Distribution System (VICDS), would be best managed by placing the responsibility on the BOWMAN contractors, rather than developing a MOD solution. This change in procurement strategy was approved in February 1997, when approval was also given for the BOWMAN core Risk Reduction phase. To date VICDS Development has cost £10m at 1997/1998 prices.

In November 1996, the two consortia announced their intention to form a Joint Venture Company (JVC) known as ARCHER, to bid jointly for the BOWMAN supply contract. Following a review of the procurement options open to the Department, approval for a revised, single source, procurement strategy for BOWMAN and the remainder of the risk reduction work was granted in March 1997.

Significant future milestones on the project include:	
Request For Proposals (RFP) issue:	June 1997
Production Approval Sought :	October 1998
Contract Placement :	December 1998

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
ITT Defence (UK) Ltd (Feasibility Study stage 2)	Firm Task Rate	International Competition
Siemens Plessey Systems Ltd (Feasibility Study stage 2)	Firm Task Rate	International Competition
ITT Defence (UK) Ltd (Project Definition stage 1)	Firm Price	International Competition
Siemens Plessey Ltd (Project Definition stage 1)	Firm Price	International Competition
Racal Communications Ltd (Project Definition stage 1)	-	International Competition sub contract

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	130	-	130
Estimate of Costs at MOD Approval	117	-	117
Difference	+13	-	+13

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Changed costing	11	3	Final negotiations on software and Integrated Logistics Support (ILS) requirements. Greater complexity and volume of work associated with assessing options to meet the requirement (+£3m). Additional support to the project to define the performance requirement. Greater than expected scope of operational analysis work and the need for work to define the proposal to split BOWMAN into 2 stages (+£5m).Changes to PD1 contracts relating to trials, national security policy and Government Furnished Information (GFI) (+£3m). Cancellation of some FS2 tasks and reduced DERA support (-£3m).
Slippage	5	-	Extension of DERA technical support tasks and retention of technical support staff as PD1 programme slipped (+£5m).
Total	16	3	

Total Balance	+13

Expenditure to date (31 March 1997): £90m

Approval	Date	Explanation
First approval:	1988	Feasibility Study stage 1 (FS1)
Latest approval:	1993	Feasibility Study stage 2 (FS2) & Project Definition stage 1 (PD1)
		Integration of BOWMAN/VICDS; A Risk Reduction
	1997	Phase & change of Procurement Strategy

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	N/A (Study Contracts Only)
Cost Change since Main Contract Award	N/A (Study Contracts Only)

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
N/A	-	-	-
Total	-	-	-

Total Balance	-

Year(s) of Peak Expenditure: 2002/2003 & 2003/2004

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). ***

Unit Production Cost (UPC)	Quantities Required
BOWMAN ***	approximately 56,000
VICDS ***	approximately 11,500

IN-SERVICE DATES

ISD Definition: The date when the first brigade group is fully trained, equipped and logistically supported.

Original ISD(Month/Year)	1995 (Assumed December)
Forecast ISD (Month/Year)	March 2002
Variation (Month(s))	+75

EXPLANATION OF ISD SLIPPAGE

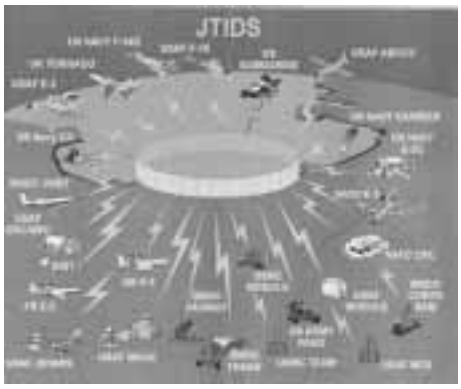
Factor	Increase (Months)	Decrease (Months)	Explanation
Technical difficulties	+24	-	Greater complexity and volume of work in development of Performance Requirement and evaluation of options for meeting it. Further work in support of applying the principles of "Learning From Experience" to the project and BOWMAN's selection as a pilot programme for the application of Integrated Logistic Support techniques. Greater level of Operational Analysis in support of robust Performance Requirement in the light of the collapse of the Warsaw Pact (+24 months)
Budgetary constraints	40	-	The need to match the programme to available resources in the overall pattern of MOD priorities (+40 months).
Programme changes	7	-	Work in support of changes in VICDS procurement strategy and integration into BOWMAN programme. Need to reconsider BOWMAN Procurement Strategy in light of changes in industry (+7 months).
ISD redefinition	4	-	Change in ISD from 'the start of a brigade-group sized Service Acceptance Trial involving elements of all 3 Services', to 'the end of the trial and resultant service acceptance' (+4 months).
Total	75	NIL	

Total Balance	+75

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	£8m

Joint Tactical Information Distribution System (JTIDS) for Royal Navy Ships & Aircraft



Director General Responsible:
DIRECTOR GENERAL COMMAND INFORMATION SYSTEMS (DGCIS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

Joint Tactical Information Distribution System (JTIDS) is a secure, Electronic Counter Measure (ECM) resistant, high capacity, tactical datalink system that provides digital and voice communication and accurate relative navigation capabilities to air, land and maritime tactical operations using the Link 16 message standard.

The original Requirement for Royal Navy JTIDS, covering all platforms of Frigate size and above, SEA HARRIER aircraft and Airborne Early Warning (AEW) helicopters, was endorsed for Project Definition (PD) in April 1984. This approach envisaged close collaboration with the United States Navy on a common system. The US Navy changed their requirement in October 1985 and this resulted in a re-appraisal of the Royal Navy's requirement.

An updated Requirement for a Project Definition phase covering Invincible Class Aircraft Carriers (CVSG), Type 42 Destroyers and SEA HARRIER aircraft was endorsed in August 1988. The requirement was re-endorsed in August 1993 for Full Development and Production for ships, and for Project Definition for SEA KING AEW. Approval was given in November 1994 for the Full Development and Production for SEA HARRIER and SEA KING AEW.

Deliveries of the 'A' Model Development Terminals for SEA HARRIER/SEA KING AEW were made in February 1997, three months ahead of schedule.

Significant future milestones on the project include:

Ships:	
First terminal accepted by Prime Contractor:	May 1997
First Royal Navy JTIDS Ship System (RNJSS) Factory Acceptance Tests:	March 1998
Aircraft:	
Detailed Design Review	May 1997
Completion of the SEA HARRIER Attrition Buy (SHAR) integration risk reduction phase:	March 1998
Delivery of 'B' Model Terminal	April 1998

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
Data Links Processing Systems. (Ships)	2000
Action Data Automated Weapon System. (Ships)	2000
Electronic Warfare Control Processor. (Ships)	2000
SEA KING AEW Mission System upgrade. (Aircraft)	2000

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Siemens Plessey Systems Ltd (Ships)	Firm Price	Prime contractor - UK Competition with international sub-contractors.
Rockwell Collins	Firm Price	Sub-contractor competition via UK Prime contract.
Rockwell International (Aircraft)	Firm Price	Prime contractor Open international competition
British Aerospace (Aircraft)	Firm Price	Prime contractor Sole source - NAPNOC

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	33	187	220
Estimate of Costs at MOD Approval	27	196	223
Difference	+6	-9	-3

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Ships: Changed costing	-	18	Reduced estimate of costs following international competition to fit JTIDS into naval vessels (-£18m).
Aircraft: Changed costing	27	12	Reduced estimate of costs following international competition to fit JTIDS into naval aircraft (-£12m). Addition of Defence Evaluation and Research Agency (DERA) costs (+£6m). Revised costs to reflect increased integration programme for SEA HARRIER (+£21m).
Total	27	30	

Total Balance	-3

Expenditure to date (31 March 1997): Ships: £21m
Aircraft: £17m

Approval	Date	Explanation
First approval:	April 1984	Project Definition and associated studies for Naval Vessels and AEW Aircraft
Latest approval:	November 1994	Full Development and Production for Naval Aircraft

PROJECT CONTRACT SUMMARY

	Ships	Aircraft
Current Cost of Main Contract	£20m (Development & Production RNJSS/CLS)	£31m (Development & Production JTIDS/CLS Terminal)
Cost Change since Main Contract Award	NIL	NIL

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

Year(s) of Peak Expenditure: Ships: 1997/1998 & 1998/1999
Aircraft: 1999/2000 & 2000/2001

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). NIL

Unit Production Cost (UPC)	Quantities Required
Aircraft ***	65 (including spares & support)
Ships ***	17

IN-SERVICE DATES

ISD Definition: Ships: the outfit of one INVINCIBLE Class Aircraft Carrier and two TYPE 42 Destroyers
Aircraft: the outfit of eight SEA HARRIER aircraft and two SEA KING AEW helicopters.

	Ships	Aircraft (SEA HARRIER)	Aircraft (SEA KING)
Original ISD(Month/Year)	June 1993	June 1998	December 1999
Forecast ISD (Month/Year)	December 2000	June 2002	December 2000
Variation (Month(s))	+90	+48	+12

EXPLANATION OF ISD SLIPPAGE

Ships:

Factor	Increase (Months)	Decrease (Months)	Explanation
Changed requirement	54	-	Change of US requirement by US Navy in October 1985 led to a need for a reappraisal of the Royal Navy's requirement (+54 months).
Budgetary constraints	36	-	The need to match the programme to the available resources (+36 months).
Total	90	NIL	

Total Balance	+90

Aircraft (SEA HARRIER):

Factor	Increase (Months)	Decrease (Months)	Explanation
Budgetary constraints	30	-	The need to match the programme to available Departmental resources (+30 months).
Unforeseen technical difficulties	18	-	Technical Definition difficulties (+18 months).
Total	48	NIL	

Total Balance	+48

Aircraft (SEA KING AEW):

Factor	Increase (Months)	Decrease (Months)	Explanation
Budgetary constraints	12	-	The need to match the programme to available Departmental resources (+12 months).
Total	12	NIL	

Total Balance	+12

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	N/A

SKYNET 4 Stage 2 - UK Military Satellite Communication System

Director General Responsible:
DIRECTOR GENERAL COMMAND INFORMATION SYSTEMS (DGCIS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

SKYNET 4 Stage 2 will enable continued use of satellite communications by the UK Armed forces until the early part of the next century. This ability is essential to meet intra and inter-theatre operational requirements, ensuring mobile forces (sea, air and land) are not constrained by the need to remain within the range of terrestrial radio communications.

To meet the required capacity and availability, three satellites will be launched. The first will be launched in late 1997 or early in 1998, and will be in-service later that year. The second will be launched and in-service during 1998 followed by the third, launched in 1999 and in service by the year 2000.

The Project Definition stage was completed early in 1993 and a contract placed with British Aerospace Space Systems Ltd (BAeSSL) in February 1994 for the production and launch of two satellites. In April 1994 Matra Marconi purchased BAeSSL to form Matra Marconi Space Systems Ltd.

In February 1996 the Production/Launch contract was amended to include a third satellite, required to ensure that system availability is maintained until the introduction of SKYNET 5 in 2005.

Significant future milestones on the project include:	
Second evaluation review of second satellite	October 1997
In-Orbit Acceptance of first satellite	May 1998
In-Orbit Acceptance of second satellite	November 1998
System Evaluation Review of third Satellite	December 1998
In-Orbit Acceptance of third satellite	April 2000
System Acceptance	June 2000

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Matra Marconi Space Systems Ltd (Production)	Firm Price	Non-competitive but with competition for sub-contracts, the value of which amount to 45% of the overall value of the prime contract
Matra Marconi	Firm price	Sub-contract

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	14	482	496
Estimate of Costs at MOD Approval	14	526	540
Difference	NIL	-44	-44

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Changed costing	4	48	Reassessment of Defence Evaluation and Research Agency (DERA) tasking (+£4m). Contract negotiations with the prime contractor on the third satellite (-£38m). Contract negotiations with the prime contractor on the first two satellites (-£2m). Reduction in risk management provision (-£7m). Reduced provision for United States Air Force (USAF) launch monitoring costs (-£1m).
Total	4	48	

Total Balance	-44

Expenditure to date (31 March 1997): £298m

Approval	Date	Explanation
First approval:	1991	Approval for Feasibility.
Latest approval:	1995	Approval for Production of third Satellite

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£447m (Production & launch)
Cost Change since Main Contract Award	+£123m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Changed requirement	123	-	Contract amended to include the production and launch of third satellite (+£123m).
Total	123	NIL	

Total Balance	+123

Year(s) of Peak Expenditure: 1994/1995 & 1995/1996

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). NIL

Unit Production Cost (UPC)	Quantities Required
£162m (First & Second Satellites)	2
£123m (Third Satellite)	1

IN-SERVICE DATES

ISD Definition: The acceptance of the first Satellite in orbit

Original ISD(Month/Year)	May 1997
Forecast ISD (Month/Year)	May 1998
Variation (Month(s))	+12

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Procurement delays	12	-	Under-estimate in satellite build time (+3 months). Additional time for commencement and completion of PD phase (+6 months). Negotiation on the Production contract (+3 months).
Total	12	NIL	

Total Balance	+12

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	N/A

SKYNET 5 - UK Military Satellite Communication System

Picture not available

Director General Responsible:
DIRECTOR GENERAL COMMAND INFORMATION SYSTEMS (DGCIS)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

SKYNET 5 will replace SKYNET 4 Stage 2 early next century enabling continued satellite communications by the armed forces. This ability is essential to meet intra and inter-theatre operational requirements, ensuring mobile forces (sea, air and land) are not constrained by the need to remain within the range of terrestrial radio communications.

The two Feasibility Study contracts were placed with Matra Marconi and British Aerospace Space Systems Ltd (BAeSSL). In April 1994 Matra Marconi purchased BAeSSL and formed Matra Marconi Space Systems Ltd. (MMSSL). The Feasibility Studies were completed in April 1995 and their assessment was completed in January 1996. Since then, detailed discussions have been taking place with France and Germany to establish a collaborative programme, TRIMILSATCOM. ***

In order to meet capacity and availability requirements, the in-orbit acceptance date for the first satellite is 2005.

Significant future milestones on the project include:	
PD phase start	Early 1998
PD phase complete	Early 2000
Production start	Early 2001
Launch of first Satellite	October 2004

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Matra Marconi Space Systems Ltd (Feasibility Study)	Fixed Price	Competitive in UK
Matra Marconi(Feasibility Study)	Fixed Price	Competitive in UK

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	27	-	27
Estimate of Costs at MOD Approval	28	-	28
Difference	-1	-	-1

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Changed Costing	4	5	Cost of additional studies to examine the effects of Germany joining the programme (+£3m).Cost of additional Defence Evaluation Research Agency (DERA) work on TRIMILSATCOM (+£1m). Reduction due to competitive contract negotiations (-£5m).
Total	4	5	

Total Balance	-1

Expenditure to date (31 March 1997): £16m

Approval	Date	Explanation
First approval:	1993	Approval for Feasibility
Latest approval:	1993	Approval for Feasibility

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	N/A
Cost Change since Main Contract Award	N/A

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
N/A	-	-	-
Total	-	-	

Total Balance	-

Year(s) of Peak Expenditure:	2001/2002 & 2002/2003
Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m).	£1,200m (Full requirement is yet to be defined.)

Unit Production Cost (UPC)	Quantities Required
Not available	***

IN-SERVICE DATES

ISD Definition: Acceptance of first satellite in orbit.

Original ISD(Month/Year)	May 2003
Forecast ISD (Month/Year)	March 2005
Variation (Month(s))	+22

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Procurement delays	17	-	Additional time required to explore a common requirement with potential international partners (+17 months).
Change in ISD definition	5	-	ISD on original approval was for the launch of the first satellite. The agreed ISD is now the acceptance of the first satellite in orbit (+5 months).
Total	22	NIL	

Total Balance	+22

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	N/A

Advanced Short Range Air-to-Air Missile (ASRAAM)

Director General Responsible:
DIRECTOR GENERAL WEAPONS & ELECTRONIC SYSTEMS (DGWES)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

The Advanced Short Range Air-to-Air Missile (ASRAAM) will be carried on the Royal Air Force's HARRIER GR7, TORNADO F3 and EUROFIGHTER aircraft as well as on the Royal Navy's SEA HARRIER FA2. Although it is being procured to replace the current SIDEWINDER AIM-9L missile, the Royal Air Force intends to maintain SIDEWINDER AIM-9L in-service until at least 2018.

ASRAAM was originally a collaborative project under the Family of Weapons Memorandum of Understanding (MOU), signed in 1980. However, the programme encountered difficulties in the missile configuration, the establishment of effective collaborative arrangements in industry and the identification of an affordable solution. Our partner nations finally withdrew from the programme during 1989 and 1990. These difficulties caused significant delays in the procurement process, to which was added the need for two re-definition phases.

Once ASRAAM had become a national project, a competition was held. Three missile systems were considered before a contract for Full Development and Production of the first tranche of missiles was placed with British Aerospace Defence Division (now Matra BAe UK Ltd) in March 1992, with deliveries scheduled to take place in 1998-2000. An order for a second tranche of missiles was placed in March 1994. First dispersion firings, to prove safe separation from the launching aircraft, and the first homing firing have taken place successfully. More recently there have been significant delays in the development firing programme which could impact the planned ISD of December 1998.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
HARRIER GR7	1990
SEA HARRIER FA2	1993
TORNADO F3 Capability Sustainment Programme	1998

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Matra BAe UK Ltd (Development/Production Package)	Fixed Price	International Competition

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development £m	Production £m	Total £m
Current Estimate of Costs	99	784	883
Estimate of Costs at MOD Approval	108	781	889
Difference	-9	+3	-6

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Inflation	4	-	Difference in price uplift between specific indices and the GDP Deflator (+£4m).
Changed requirement	43	-	The requirement to carry out Service Evaluation Trials (+£42m). The purchase of buffer connectors providing an interface between the missile and airframe electronics (+£1m).
Changed Costing	5	58	Reduction in prices achieved as a result of contractual negotiations for the development/production package (-£36m). Reduction in the cost of the rocket motor following decision to procure a cheaper motor (-£9m). Curtailment of the collaborative Development programme following the withdrawal of our partner nations (-£13m). An increase due to the need for greater Defence Evaluation and Research Agency (DERA) support to the Development/Production package (+£5m).
Total	52	58	

Total Balance	-6

Expenditure to date (31 March 1997): £429m

Approval	Date	Explanation
First approval:	1981	Pre-Feasibility Study
Latest approval:	1994	Second Tranche Production

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£740m (Development & Production)
Cost Change since Main Contract Award	£69m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Inflation	4	-	Difference in annual uplift between specific indices and the GDP Deflator (+£4m).
Changed costing	-	9	A reduction in the cost of the rocket motor following decision to procure a cheaper motor (-£9m).
Changed requirement	74	-	An increase following the exercise of a contract option to procure a second tranche of missiles (+£74m).
Total	78	9	

Total Balance	+69

Year(s) of Peak Expenditure: 1997/1998 & 1998/1999

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). NIL

Unit Production Cost (UPC)	Quantities Required
£0.2m	***

IN-SERVICE DATES

ISD Definition: Acceptance of the Certificate of Design and the performance Statement, with the subsequent delivery of 60 missiles that are fit for purpose.

Original ISD(Month/Year)	1994 (Assumed December)
Forecast ISD (Month/Year)	December 1998
Variation (Month(s))	+48

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Need for project re-definition	12	-	Two redefinition phases were required as a result of problems encountered during the collaborative stage of the project (+12 months).
Procurement delays	24	-	Delays caused by difficulties in agreeing the specification with our partner nations (+24 months).
Budgetary constraints	12	-	The need to match expenditure to available Departmental resources (+12 months).
Total	48	NIL	

Total Balance	+48

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	NIL

Medium Range (MR) TRIGAT

Director General Responsible:
DIRECTOR-GENERAL WEAPONS AND ELECTRONIC SYSTEMS (DGWES)

PROJECT DESCRIPTION, PROGRESS AND KEY FUTURE EVENTS

Medium Range (MR) TRIGAT is a crew-portable anti-tank guided weapon system for the Infantry and Royal Marines, which will be capable of defeating improved armour of potential enemies at a maximum range of 2000m. It will replace MILAN, and comprises a firing post, a missile and a thermal sight, allowing effective operation at night and in adverse weather conditions. MR TRIGAT is a multilateral project with the United Kingdom, France and Germany as Pilot Nations and Belgium and the Netherlands as Associate Nations. It is currently in Full Development.

Industrial qualification trials began in February 1994 and are due to be completed in the summer of 1997. They will be followed by multilateral official Services evaluation/user trials and national trials between 1997 and 1998. The purpose of these trials is to test the performance of the missile system to demonstrate achievement of the design specification prior to formal national acceptance. Whilst the programme is behind schedule and some minor areas of technical difficulty remain, there is confidence that the final developed system will meet the requirement. However contractual arrangements for the industrialisation and production phase have yet to be completed. Changes in force structure have resulted in a decrease in the required number of firing posts. An error in previous programme costings caused the number of missiles required to be understated. This has now been corrected and included in this report.

ASSOCIATED PROJECTS CRITICAL TO ACHIEVEMENT OF ISD

Project Title	ISD
N/A	-

PURCHASING ARRANGEMENTS

Contractor	Contract Type	Procurement Route
Euromissile Dynamics Group (EMDG) comprising : Matra BAe Dynamics (UK) Limited; Aerospatiale; Lenkflugkorpersysteme.	Fixed Price	Single source, non-competitive Development Contract (The French MOD are the Contracting Authority)

PROJECT COSTS SUMMARY

(At 1997/1998 average forecast of outturn prices to the nearest £m)

Breakdown of Procurement Costs	Development[(1)] £m	Production £m	Total £m
Current Estimate of Costs	129	-	129
Estimate of Costs at MOD Approval	115	-	115
Difference	14	-	+14

Note (1): The Feasibility Study and Project Definition phases were combined for both the Medium Range and Long Range TRIGAT projects and meaningful separation of costs is not possible. These costs are for Full Development only.

REASONS FOR COST VARIATION

Factor	Increase £m	Decrease £m	Explanation
Inflation	-	10	Difference in annual price uplifts between specific indices and GDP deflator (-£10m).
Exchange rates	13	-	Variation in the value of Sterling against the Deutschmark and the French Franc (+£13m).
Changed requirement	-	12	Reduction in national costs e.g Trials, outside the main contract (-£11m) and the cancellation of a small simulator on the main contract (-£1m).
Changed costing	23	-	Reduction in the number of partner nations. Spain, Italy & Greece did not join the programme as expected prior to the main contract let (+£23m).
Total	36	22	

Total Balance	+14

Expenditure to date (31 March 1997): £93m

Approval	Date	Explanation
First approval:	1979	Feasibility Study (Medium Range & Long Range TRIGAT)
Latest approval:	1988	Full Development (Medium Range TRIGAT only)

PROJECT CONTRACT SUMMARY

Current Cost of Main Contract	£105m (Development)
Cost Change since Main Contract Award	+£5m

REASONS FOR COST VARIATION SINCE LAST CONTRACT AWARD

Factor	Increase £m	Decrease £m	Explanation
Exchange rates	12	-	Variation in the value of Sterling against the Deutschmark and French Franc (+£12m).
Changed costing	-	6	Belgium and the Netherlands joined the programme (-£6m).
Changed requirement	-	1	Cancellation of a small simulator (-£1m).
Total	12	7	

Total Balance	+5

Year(s) of Peak Expenditure: 2003/2004 & 2004/2005

Further Expenditure in Clear Prospect: (at 1997/1998 average forecast of outturn prices to the nearest £10m). £770m (Based on the quantities required below)

Unit Production Cost (UPC)	Quantities Required
Missiles £ 18K	***
Firing Posts £212K	***

IN-SERVICE DATES

ISD Definition: First Battalion fully equipped with all its Firing Posts and first line missile stocks.

Original ISD(Month/Year)	December 1995
Forecast ISD (Month/Year)	December 2000
Variation (Month(s))	+60

EXPLANATION OF ISD SLIPPAGE

Factor	Increase (Months)	Decrease (Months)	Explanation
Unforeseen technical difficulties	12	-	Due to problems with warhead, integration and guidance (+12 months).
Procurement delays	24	-	An under estimation of the time each partner nation would require to achieve the necessary internal financial approval to move to Production (+24 months).
Budgetary constraints	24	-	The need to match the programme to available Departmental resources (+24 months).
Total	60	NIL	

Total Balance	+60

COST OF ISD SLIPPAGE

Additional Costs arising as a result of delays to ISD (for delays over 24 months) (at 1997/1998 average forecast of outturn prices):	£1m

Appendix 2: Glossary

Glossary

ASTUTE CLASS SUBMARINES (BATCH 2 TRAFALGAR CLASS): New nuclear-powered attack submarines to replace the Swiftsure class.

SPEARFISH: A submarine-launched heavyweight torpedo with both anti-submarine and anti-surface ship capabilities.

SWIFTSURE AND TRAFALGAR CLASS NUCLEAR SUBMARINE UPDATE: Update to Swiftsure and Trafalgar class submarines to provide improvements to sonar, command and tactical weapons systems.

TOMAHAWK LAND ATTACK MISSILE (TLAM): A conventionally armed land attack missile capable of launch from submarines.

ACTIVE DECOY ROUND - OUTFIT DLH: A conversion of the SEAGNAT ship control system to allow firing of an active decoy round which seeks and seduces anti-ship missiles.

COMMON NEW GENERATION FRIGATE (CNGF): New class of Anti-Air Warfare frigate to replace the Type 42 class Anti-Air Warfare destroyer.

LANDING PLATFORM DOCK (REPLACEMENT) (LPD(R)): Replacements for the amphibious assault ships Fearless and Intrepid. LPD(R)s will be used to launch and co-ordinate amphibious operations.

SONAR 2087: A tactical, variable depth, active and passive sonar system to be retro-fitted to all Type 23 Frigates during refit.

CHALLENGER 2: Challenger 2 is the replacement for the Army's Chieftain and Challenger 1 Main Battle Tanks.

COBRA (COUNTER BATTERY RADAR): A long range radar for locating rocket, gun and mortar batteries.

TRUCK UTILITY LIGHT / MEDIUM / MEDIUM (HEAVY DUTY) (TUL/TUM/TUM(HD)): Four wheel drive load carrying utility vehicles to be used in a variety of roles.

EUROFIGHTER: Agile fighter aircraft with an offensive support capability.

TORNADO GR1 MID-LIFE UPDATE (MLU): The update will provide improvements to the aircraft's avionics and armament to enhance its ability to find and attack targets in all weathers while reducing vulnerability to counter attack.

HERCULES C-130J: Replacement fleet of transport aircraft for part of the existing fleet of Hercules aircraft, which is nearing the end of its operationally useful life.

REPLACEMENT MARITIME PATROL AIRCRAFT (RMPA): Replacement for the current fleet of Nimrod MR Mk2 patrol aircraft, whose principal war roles are anti-submarine warfare and anti-surface ship warfare.

ATTACK HELICOPTER - WAH 64 APACHE: A version of the United States Army's AH-64D attack helicopter. Apache will be equipped with Longbow radar, Hellfire missiles, ground suppression rockets and an air-to-air missile, and be powered by the Rolls Royce Turbomeca RTM 322 engines.

CHINOOK MEDIUM SUPPORT HELICOPTER: Large helicopter designed to carry up to 54 troops or internal freight, including vehicles, as well as underslung loads.

EH101 "MERLIN" : Anti-submarine warfare helicopter. A variant of the Anglo-Italian EH101 helicopter, it will operate from Type 23 Frigates and Invincible class aircraft carriers.

EH101 SUPPORT HELICOPTER (SH EH101): Based on the Utility version of the Anglo-Italian EH101 helicopter, it is designed to carry 24 troops or a range of vehicles or underslung loads.

BOWMAN : BOWMAN will provide the Armed Forces with a combat radio system to replace CLANSMAN.

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM FOR ROYAL NAVY SHIPS AND AIRCRAFT (JTIDS): A secure tactical datalink system for air, land and maritime operations.

SKYNET 4 STAGE 2: Satellite communications system to replace the existing SKYNET 4 Stage 1 constellation.

SKYNET 5: Satellite communications system to replace SKYNET 4 Stage 2 during the next decade.

ASRAAM (ADVANCED SHORT RANGE AIR-TO-AIR MISSILE): Missile equipped with an infra-red seeker. It will replace the AIM-9L Sidewinder missile and be carried by Harrier GR7, Eurofighter and Tornado F3 aircraft.

MEDIUM RANGE TRIGAT: A crew-portable anti-tank guided weapons system, incorporating a missile with a tandem charge warhead supported by a laser guidance system with a thermal sight.

Appendix 3

Glossary of contractual and procurement terms

Design Authority

The agency appointed by the Department to be responsible for the detailed design of an equipment and, in the case of aircraft, responsible for providing advice concerning airworthiness. The design authority is often the original design contractor.

Earned value

A measure of project progress relating expenditure to the rate of technical achievement.

Firm Price

An agreed price which takes account of forward inflation and thus is not subject to variation.

Fixed Price

An agreed price which is subject to variation to take account of inflationary and/or exchange rate movements. Inflationary movements are reflected in a Variation of Price (VoP) clause usually on the basis of published indices. Agreed prices normally contain a Non-Variable Element amounting to at least 10% of the contract price which is not subject to variation for inflation. Exchange rate variations are reflected in an Exchange Rate Variation (ERV) clause.

Fixed Price plus Incentive Fee

A target cost and target fee for profit are established together with an arrangement for sharing between the Department and the contractor the amount by which the actual costs are above or below the target cost. There is a maximum price above which the contractor has to bear all costs.

Government Profit Formula

A formula designed to give contractors a fair return on capital employed on non-competitive contracts. This is equal, on average, to the overall return earned by British industry.

Indemnity

Protection for the contractor against particular risks on a project whereby the Department agree to bear the cost consequences of the risks maturing.

Investment Appraisal

A comparison of the alternative investment options on a purely financial basis.

Liquidated Damages

A contractually pre-agreed sum payable in the event of a specific breach of contract (e.g. late delivery) by way of compensation.

Long Term Costings

The Department's budgeting process through which the overall defence programme is adjusted to meet the planned resources available over the next 10 years.

Milestone payments plan

A payments schedule wherein payment is contingent upon achievement of pre-agreed objectives by the contractor.

NAPNOC (No Acceptable Price No Contract)

The Department's policy for non-competitive pricing which seeks to replicate the pressures of competitive procurement in which a price is secured at the outset through the tendering process. Under the NAPNOC policy, non-competitive contracts are only placed when a price has been agreed which reflects what it should cost an efficient contractor to carry out the work. NAPNOC contracts must, therefore, be priced before a contract is placed.

Prime contractorship

A contractor having overall responsibility for co-ordinating and integrating the activities of a number of sub-systems contractors to meet the overall system specification efficiently, economically and to time.

Project Definition

Project definition comprises a full examination of the technical difficulties involved in meeting the stated requirement. Industry is required to produce detailed estimates of the cost and timescale of development and production. A key delivery out of project definition, particularly when it is competitive, may be a quotation, rather than an estimate. At the end of project definition there should be no doubt as to the viability of a project.

Request for Information (RFI)

A request by the Department for the contractor to supply outline details on how he would meet the requirement.

Risk or contingency provision

The financial provision within the contractor's price (or the Department's estimate of cost) which is included against the possibility of certain risks maturing.

Ship Submersible Nuclear

A nuclear powered submarine in the United Kingdom fleet.

"Should Cost" data

Data to support the negotiation of a fair and reasonable price based on what it should cost an efficient contractor working at optimum levels to perform the task, informed by external benchmarking where applicable. This contrasts with a price based on "will cost" data such as a contractor's present cost structure, existing methods of operation and general efficiency.

Whole boat strategy

The prime contractor is made responsible for the design and build of the submarine hull, integrating the various associated equipments and an initial period of in-Service support.