NATIONAL AUDIT OFFICE

Ministry of Defence

Maximising the benefits of defence equipment co-operation

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 300 Session 2000-2001: 16 March 2001

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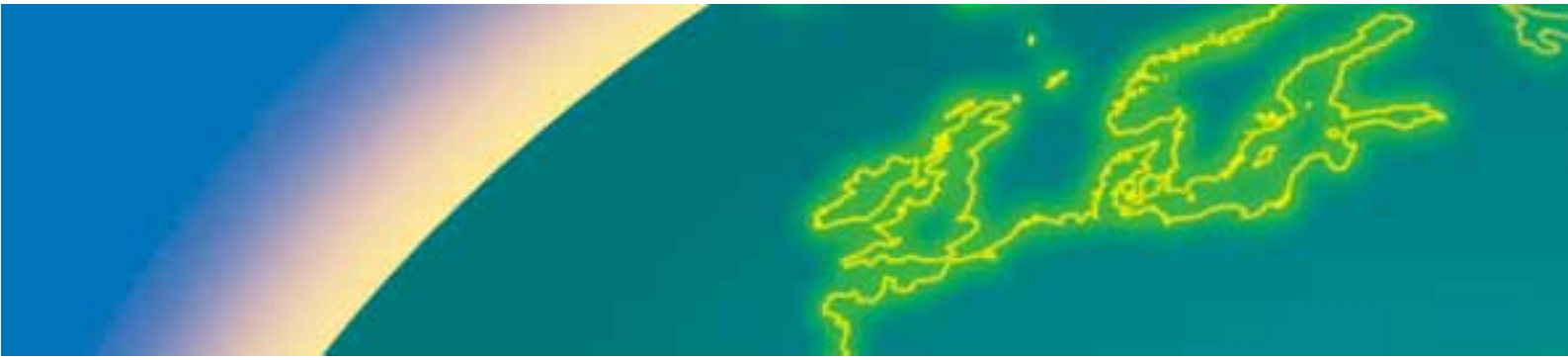

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John Bourn **National Audit Office**
Comptroller and Auditor General **12 March 2001**

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executive summary

"International collaboration is of increasing importance to our forward equipment programme. It offers tangible military, economic and industrial benefits and it is essential that the United Kingdom remains at the forefront of developments in this area of joint endeavour."

1998 Strategic Defence Review (Cm3999)

1 In 1998/99 the Ministry of Defence (the Department) spent 13 per cent of the defence equipment budget (£1.3 billion) on 64 co-operative equipment programmes involving 19 partner nations. The number of co-operative programmes, and the proportion of the defence budget committed to co-operation, is likely to rise in future as a number of programmes currently in their early stages come on stream. Our study examines what the benefits of co-operation are, what is being done to deliver the full range of benefits and how the Department decides to commit to co-operative programmes.

The benefits of defence equipment co-operation

2 Co-operation in defence research offers economic and technology benefits, generating a 5:1 return on the Department's £40 million annual investment on joint research programmes and providing knowledge with an annual value of approximately £280 million at minimal cost through information exchange programmes.

3 Co-operating in the procurement of defence equipment brings economic benefits by sharing development costs and through economies of scale in the production and, further through the lifecycle, by sharing in-service support and upgrade costs. The Department has been successful in taking into account the cost implications (both positive and negative) of co-operation, although the timescale implications have been more difficult to manage because these are not under Her Majesty's Government's control.

4 In military terms, co-operative procurement can enhance inter-operability with allies. Post Cold War changes in the global security environment have seen an increasing emphasis on the need to harmonise mission capabilities with allies for joint and coalition operations. From an industrial perspective, defence equipment co-operation holds the prospect of preserving existing, and developing new, market influences and technological competence as well as influencing industrial restructuring. International political benefits, such as the strengthening of security relationships and the enhancement of European security and defence identity can also flow from defence equipment co-operation.

How the Department is addressing the challenges of co-operation

5 Equipment co-operation does not take place in a void. We therefore welcome the Department's document the *Future Strategic Context for Defence* which was published earlier this year and sets out likely future international developments. The processes adopted for planning and managing co-operative activity operate within this framework and affect the potential for realising co-operative benefits. The United Kingdom is involved in a number of specific initiatives and has put in place an over-arching arrangement with some of its partners in Europe (the Letter of Intent) and with the United States (the Declaration of Principles) which should help to provide a more solid baseline against which to plan and undertake co-operative programmes as well as facilitating the restructuring and efficient operation of the defence industry.

6 In harmonising national partners' equipment needs, the various high level international forums established specifically for the task have historically been less successful in generating fully-fledged co-operative programmes than working level contacts. The ability of nations to identify potential opportunities for co-operation under both approaches has been constrained by difficulties in aligning national requirements and differences in national legal systems planning timescales and funding and approvals processes. If more widely adopted, the "Capability Management" approach – which is already being introduced in the United Kingdom – should facilitate cost, schedule and capability trade-offs and hence overcome some of the difficulties which have previously constrained the scope for co-operation.

- We commend the Department's actions in taking forward the Capability Management initiative and endorse its intention to encourage partners to discuss opportunities for co-operation on the basis of future capability needs rather than specific requirements.

7 In the defence research area, developments enshrined in the Declaration of Principles, the Letter of Intent and the proposed "EUROPA" Memorandum of Understanding, hold the prospect of addressing some of the longstanding factors which have tended to constrain defence research co-operation. Nationally, the Department has also embarked on initiatives, such as the "Towers of Excellence" model, which, although still in their formative stages, could enhance decisions on which co-operative research opportunities to take up. In taking forward these actions, we recommend that the Department:

- analyses the factors which have contributed to the technological and financial success, or otherwise, of co-operative research programmes and learns the lessons so that future arrangements are identified, established and undertaken efficiently;
- completes its planned review of the methodology used to assess the benefits of co-operative defence research programmes as quickly as possible and explores the potential to augment the database with information on the Department's expectations when it commits to co-operative research and the benefits of other forms of defence research co-operation;
- in line with the intentions underpinning the agreements reached with European and United States partners;
    - enhances decision-making on where to concentrate international defence research effort and where to rely on mutual interdependence with partner nations by ensuring that plans to include a more clearly defined international dimension to the "Towers of Excellence" model are taken forward;

- ensures that the potential opportunities to rationalise and integrate the various multilateral research forums are taken full advantage of;
- encourages the co-operative use of research and testing facilities and ensures that in commissioning new facilities or modernising existing ones, full consideration is given to the scope for co-operation.

8 Turning to equipment procurement, in the past there has been considerable variety in both governmental and industrial management arrangements for co-operative procurement. Complex management and decision-making structures and restrictive worksharing and other requirements have often been necessary to achieving international agreements. But this complexity has raised transaction costs and reduced potential economic benefits. Indeed, such complexity may have torpedoed promising collaboration ventures before they could come to fruition. Similarly, and recognising that sharing non-recurring costs is much less of an incentive to co-operate during the support phase, differences in nations' operating and maintenance philosophies and national "customisation" of designs has meant that co-operative in-service support activity has been limited.

9 To address these challenges Germany, France, Italy and the United Kingdom have jointly developed the Organisation Conjointe de Cooperation en matière d'ARmement (OCCAR) which has the potential to bring a significant improvement in the efficiency and effectiveness of European armaments co-operation. As OCCAR evolves and takes a more significant role in managing new equipment programmes it will be important that the Department ensures that the principles underpinning the establishment of OCCAR are robustly implemented. In particular, we recommend that the Department works with its partners and OCCAR:

- to identify common success factors in previous defence equipment co-operation;
- to develop performance measures to ensure that OCCAR is able to demonstrate it is providing cost, timescale and operational benefits compared with past, or alternative, co-operative arrangements. Five possible performance measures are at Appendix D to our report;
- to monitor implementation of the principle of global balancing to ensure that worksharing arrangements do not impose cost and timescale penalties on individual equipment programmes;
- to assist in developing an equivalent of the Department's Acquisition Management System to underpin the programme management procedures which OCCAR have already produced. Such a system supported with suitable training will help to ensure that the principles already agreed are successfully implemented;
- ensure the responsibilities of the OCCAR Executive Administration, Programme Offices and nations are clearly delineated to allow the agency to function as proposed.

10 More generally, the Department has put a great deal of effort into responding to requests from its co-operative partners to explain the potential benefits of "Smart Acquisition". Whilst the scope for change on well-established programmes may be limited, there are signs that some existing programmes are being managed more effectively. We recommend that on programmes which fall outside the OCCAR umbrella, the Department works with partners to:

- learn from past experience to identify common success factors in defence equipment co-operation;
- build on the discussions which have already taken place to translate the Smart Acquisition principles into working practices which will bring about continuous improvement in the arrangements for executing both existing and new international co-operative programmes; and
- consider opportunities for co-operative support at an early point in the equipment lifecycle.

Deciding to co-operate

11 The Department has implemented a structured system of cost and operational effectiveness analysis to inform decisions on which acquisition solutions can meet most cost-effectively a given capability. The Department's consideration is informed by analyses, undertaken in consultation with other interested government departments and of varying degrees of sophistication, of the industrial and wider political factors involved. Reflecting the importance attached to many major defence acquisition decisions, over half of seventeen recent decisions on whether or not to commit to co-operative programmes were made collectively by Ministers including non-Defence Ministers. Decisions on whether to commit to co-operative programmes are already made in a way which takes into account many of the aims of the Modernising Government agenda. Revisions to the Memorandum setting out the responsibilities of Accounting Officers may also facilitate the consideration of anticipated outcomes which go beyond those specific to defence purposes.

12 We recommend that the Department:

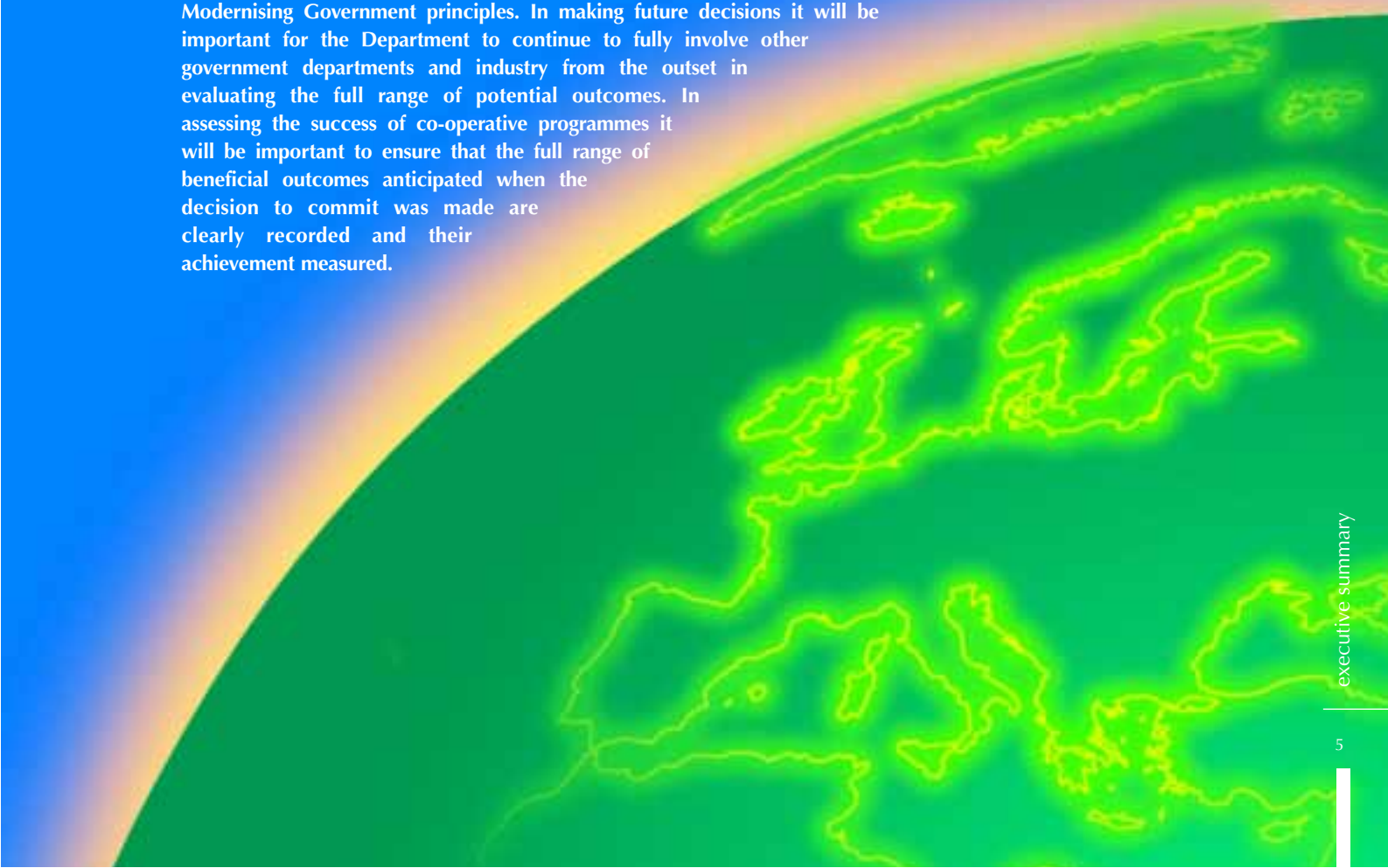
- ensures that the objectives set for the Defence Procurement Agency and Integrated Project Team Leaders responsible for delivering programmes against defined cost, timescale and performance parameters fully reflect the extra complexity and challenges which co-operative programmes often pose;
- from the outset of the decision-making process, continues to work closely with other government departments and industry to ensure that all factors affecting decisions on whether or not to co-operate are analysed rigorously with the risks to the defence vote and full range of anticipated beneficial outcomes quantified to the greatest extent possible;
- continues to work closely with other government departments to establish mechanisms to assess the achievement of all the beneficial outcomes for the United Kingdom as a whole, anticipated at the time decisions to commit to co-operative programmes are made.

Overall conclusions

13 The acquisition and management of defence equipment is an inherently complex and often expensive task. Co-operation adds another layer of complexity to the challenge of procuring equipments within time, cost and performance parameters and subsequently supporting them in-service. The track record of defence equipment co-operation to date has been mixed. Whilst there have been economic, political, military and industrial benefits, on significant numbers of co-operative procurement programmes not all of the potential benefits have been secured. Defence equipment co-operation is likely to become more important in the future and we welcome the recent initiatives taken by the Department and its partners, notably the creation of OCCAR and signing of the Letter of Intent and Declaration of Principles, which hold the prospect of addressing many of the challenges of co-operation. It will be important that the Department is able to demonstrate that the expected benefits of these initiatives are being secured.

14 The restructuring of the defence industry following the end of the Cold War has produced a smaller number of companies, certainly at the prime contractor level, but most of them have a wider range of capabilities, operate in more countries than their predecessors and some of them have the financial resources to assist in Private Finance Initiative and Public Private Partnership schemes. This industrial restructuring is itself a source of potential defence equipment co-operation, encompassing research, development, production and through life maintenance and support. Indeed, co-operation may be easier to start at the industrial than the government level, and we recommend that the Department should pay particular attention to the scope offered by cross-border industrial capabilities and partnerships in fostering its equipment procurement programme.

15 The majority of decisions on whether or not to commit to major co-operative procurement programmes are taken collectively by Ministers. In these cases, Ministers may choose to emphasise the importance of securing outcomes in addition to those which pre-dominate in the Department's own assessment, such as technical capability, costs of the project and in-service costs. This approach accords closely with Modernising Government principles. In making future decisions it will be important for the Department to continue to fully involve other government departments and industry from the outset in evaluating the full range of potential outcomes. In assessing the success of co-operative programmes it will be important to ensure that the full range of beneficial outcomes anticipated when the decision to commit was made are clearly recorded and their achievement measured.



Part 1

Introduction

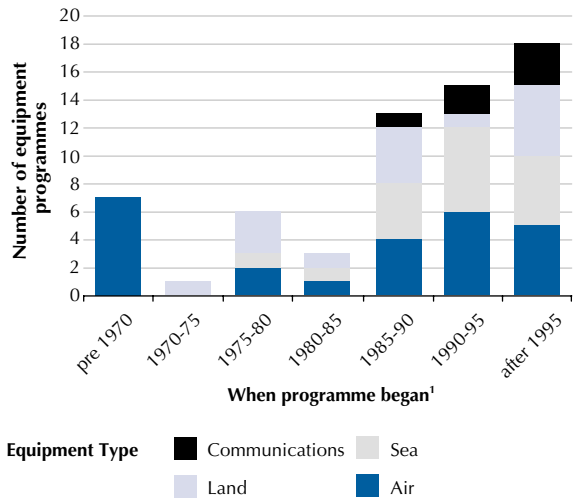
1.1 Since 1989 defence spending has fallen by nearly 25 per cent in real terms. This reduction, together with the rising costs of high technology defence research and development, smaller national production runs and changes in the strategic environment, has made international defence equipment co-operation increasingly important if the Ministry of Defence (the Department) is to meet its objective "to procure equipments which most cost-effectively meet agreed military requirements".

Defence equipment co-operation is increasing

1.2 Figure 1 shows a growing trend towards defence equipment co-operation. It shows that there has been a long history of co-operation on Air Systems – reflecting the risks associated with procuring small numbers of high value, technologically advanced equipments. Some Air Systems currently in service, such as the Lynx, Puma and Gazelle helicopters and the Harrier, Jaguar and Tornado aircraft, are the result of co-operative programmes instigated before 1970. However, Figure 1 also shows an increase in the numbers of co-operative Land and Sea Systems programmes, as well as the more recent trend towards co-operation on communications programmes.

1 Trends in defence equipment co-operation

Since 1985, the number of new co-operative programmes have been increasing



Note: 1 The beginning of a programme is the date of the first government-to-government agreement.

Source: National Audit Office

Over 13 per cent of the equipment budget is spent on co-operative programmes and this figure is likely to increase

1.3 In 1998–99, 13.2 per cent of the equipment budget (including support costs) – £1.3 billion – was spent on co-operative programmes. This figure comprises of £945 million of co-operative acquisition expenditure (13 per cent of the total spend on acquisition during 1998-99) and £337 million on co-operative in-service support arrangements (14 per cent of total in-service support expenditure during 1998–99). The figure may well increase in future if and when a number of major equipment acquisition programmes currently in their early stages – such as the Joint Strike Fighter – enter full development and production on a co-operative basis. Indicatively, as part of their work in support of the Strategic Defence Review, management consultants McKinsey & Co. estimated that of the 172 largest planned future programmes, 47 per cent by value were candidates for co-operation.

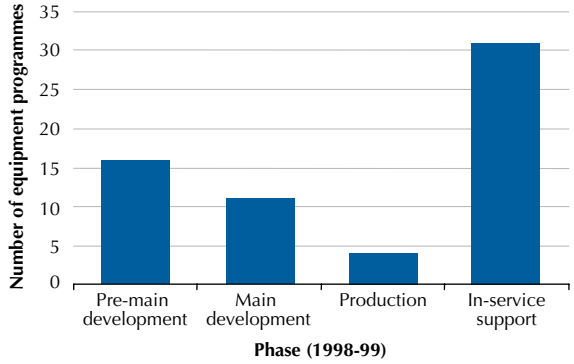
What the Department co-operates on

Co-operation takes place throughout the equipment lifecycle but most expenditure is on new procurements

1.4 Co-operative arrangements usually take the form of Memoranda of Understanding, but can also include Implementing Arrangements, Exchanges of Letters, Letters of Intent or Treaties. Our report therefore covers the pooling of research and technology funding or sharing of knowledge, through equipment specific development and production programmes and the in-service support of equipments which may or may not have been procured co-operatively. Examples of these latter equipments include the Tomahawk Land Attack

2 The stage of the equipment lifecycle at which co-operation takes place

In 1998-99, in-service support arrangements accounted for almost half the number of co-operative programmes in which the Department was involved

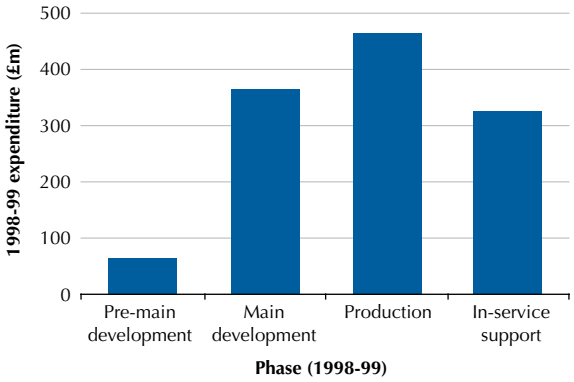


Note: Details of the 64 co-operative programmes in which the Department is participating are given in Appendix A

Source: National Audit Office

3 Expenditure on defence equipment co-operation

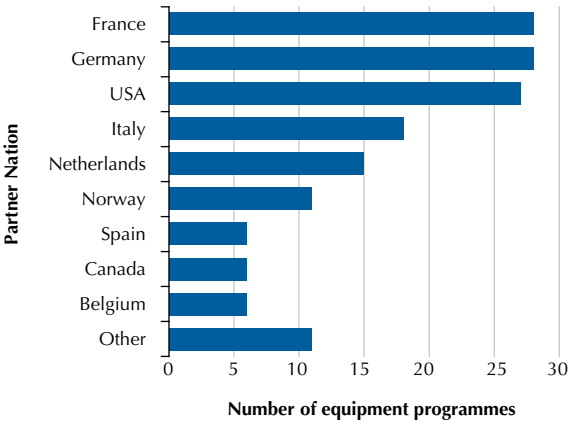
In 1998-99, over two thirds of the Department's expenditure for defence equipment co-operation was on programmes in development or production



Source: National Audit Office

4 Who the Department co-operate with

In terms of the number of programmes, most co-operation is with France, Germany and the United States of America



Source: National Audit Office

Missile which was purchased from the United States through the Foreign Military Sales route but where there is a co-operative in-service support agreement; and the Spey and Olympus marine gas turbines which were procured nationally but are supported jointly with the Netherlands, France and Belgium.

1.5 **Figure 2** shows that, in 1998-99, the Department was involved in 64 co-operative equipment programmes, split approximately equally between new equipments not yet in service and equipments already in service being supported through co-operative arrangements. However, in terms of expenditure rather than programme numbers, defence equipment co-operation is dominated by programmes in development and production. As shown in **Figure 3**, these phases accounted for over 70 per cent of the Department's expenditure on co-operative programmes in 1998-99.

Who the Department co-operates with

The Department co-operates with 19 different international partners, with the United States, France, Germany and Italy being the main partners

1.6 The 64 co-operative equipment programmes in which the Department currently participates involve 19 different international partners. As **Figure 4** shows, whilst most co-operation is with the United States, France and Germany, there is also considerable co-operation with other partners such as Italy, the Netherlands and Norway.

Eurofighter dominates the funding committed to co-operative programmes

1.7 Development and production of the Eurofighter aircraft accounts for 74 per cent of the United Kingdom's currently approved funding on co-operative acquisition programmes. This means that in terms of programme value the United Kingdom's leading co-operative partners are the other nations involved in the Eurofighter programme, Germany, Italy and Spain. If the exceptionally large Eurofighter project is excluded, the United States, Italy, France and Germany emerge as the United Kingdom's leading partners. The Department's main co-operative partners are unlikely to change in future as it makes major financial commitments on programmes such as the A400M aircraft and METEOR missile and, possibly, the Future Offensive Air System (where co-operation on technology acquisition and risk reduction may involve European countries including France, Germany, Italy and Sweden, as well as the United States) and the Joint Strike Fighter (where the United Kingdom and United States have recently agreed to extend the existing co-operation into the Engineering and Manufacturing Development phase).

How the Department co-operates

Co-operation can be structured in a number of ways

1.8 Co-operative programmes can be structured and managed in a variety of ways. At one extreme, they can be highly integrated with detailed common requirements and managerial structures and a single interface with industry. At the other extreme, they can be loosely integrated around core elements of a common requirement with industry responsible for meeting the precise needs of individual nations who contract for these separately. To date, most United Kingdom experience has been with the more highly integrated model based on the acquisition of a complete weapon system with proportional funding and worksharing, joint decision-making and an international management organisation, although some co-operation with the United States has been on the basis of purchasing equipments rather than jointly contracting for them as with European partners. Typical examples of highly integrated European projects include Eurofighter and the former Common New Generation Frigate programmes. There are fewer examples of loosely integrated programmes although the Storm Shadow Cruise Missile Programme where the purchases were independently committed by the United Kingdom and French governments does provide one good example.

Most co-operation with the United States is bilateral, whilst most co-operation with Europe is multi-lateral

1.9 **Figure 5** shows that over half of the Department's co-operative programmes are bilateral and a third involve three or four nations. Of the bilateral programmes almost half are with the United States (reflecting the fact that the definition of co-operation used in our report captures Foreign Military Sales purchases) and a fifth with France. In contrast, only 22 per cent of three or four nation programmes involve the United States, whilst 83 per cent involve Germany, 67 per cent involve France and 49 per cent involve Italy.

Previous Parliamentary coverage

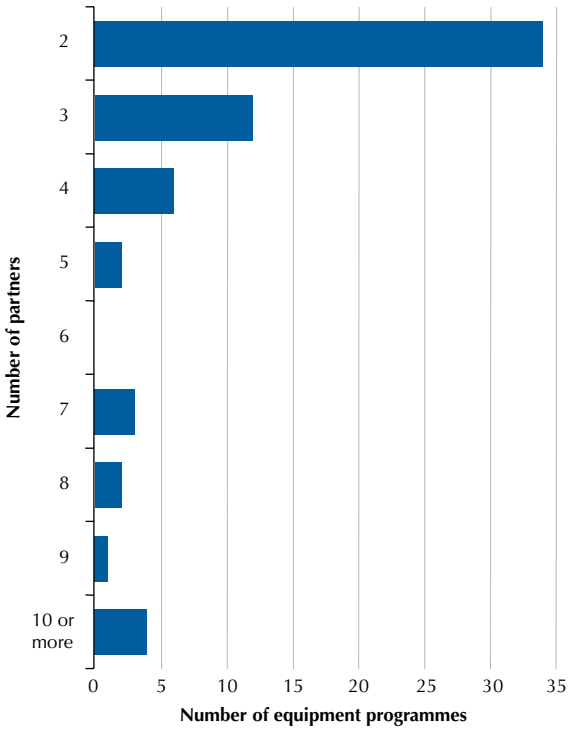
Defence equipment co-operation is a subject of Parliamentary and wider public interest

1.10 Since 1988 the National Audit Office, the Committee of Public Accounts and the House of Commons Defence Committee have published 21 reports examining the part co-operation plays in the overall equipment acquisition and support process. However, there has been no direct coverage of defence equipment co-operation since the National Audit Office's 1990–91 Collaboration Report (HC 247). Whilst supportive of the principle of co-operation, most parliamentary coverage has been critical of its practical application. **Figure 6** highlights six common themes emerging which, while by no means unique to co-operative programmes, point to shortcomings in the co-operative process.

1.11 In addition to the Parliamentary coverage, there is also a substantial body of academic and journalistic writing on defence co-operation. This analysis has also tended to focus on the complexities of the process and the wider

5 The number of partners participating with co-operative programmes involving the United Kingdom

Most programmes are bi-lateral or tri-lateral



Source: National Audit Office

6 Common themes in recent Parliamentary coverage of defence equipment co-operation

All recent reports on co-operative programmes have been critical of cost and timescale performance

Theme	Number of reports referred to
Poor cost/time performance	21
Influence of industrial factors	16
Weak contractual arrangements	11
Lack of common requirements	11
Complex management structures	9
Lack of inter-operability	4

Source: National Audit Office review of Committee of Public Accounts, House of Commons Defence Committee and National Audit Office reports

industrial implications of co-operation due to the inherently complex nature of management structures. Recently, parliamentary and public interest has been raised by a number of decisions affecting co-operative programmes. In particular, the Department has withdrawn from the TRIMILSATCOM (a co-operative communications satellite programme), agreed not to proceed with the Project HORIZON frigate programme, committed to and, other partners not having made a similar commitment, subsequently withdrawn from production of the Medium Range TRIGAT anti-tank missile, and announced its intention to participate in Meteor air-to-air missile and A400M transport aircraft (pictured opposite) programmes and a development contract has been placed on the Multi-Role Armoured Vehicle programme.

The National Audit Office examination

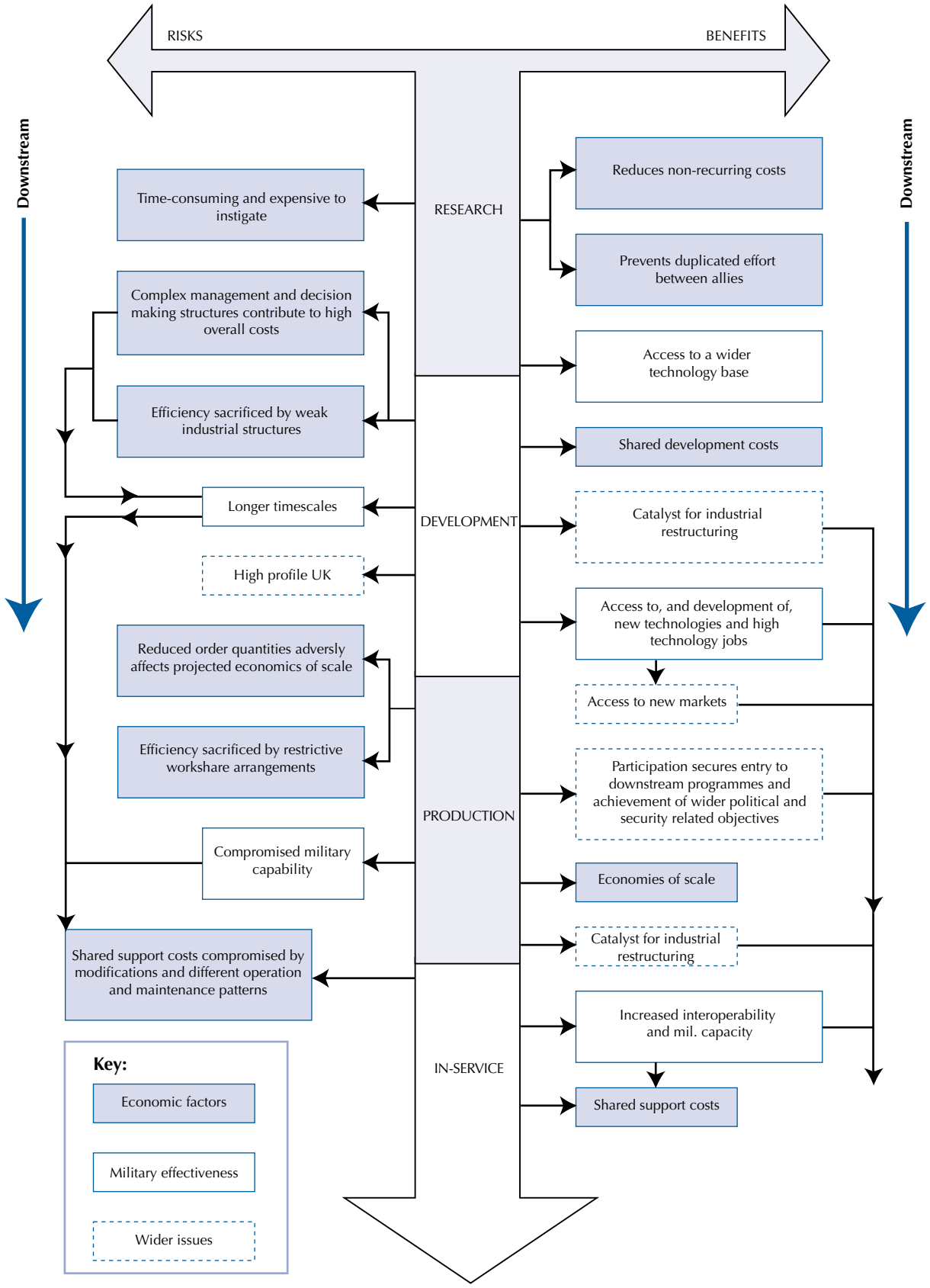
The Department recognises co-operation as a key procurement mechanism

1.12 The Department has recognised the importance of defence equipment co-operation. Supporting Essay 10 (Procurement and Industry) to the Strategic Defence Review stated that "international collaboration is of increasing importance to our forward equipment programme. It offers tangible military, economic and industrial benefits and it is essential that the United Kingdom remains at the forefront of developments in this area of joint endeavour".

Defence equipment co-operation holds the prospect of additional benefits and potential risks

1.13 **Figure 7** illustrates the benefits associated with defence equipment co-operation. It divides them into economic benefits (reducing programme costs); military benefits (enhancing equipment effectiveness through inter-operability and standardisation); and wider benefits (promoting broader United Kingdom security, industrial and political interests) and shows that they occur throughout the equipment lifecycle. It also shows that the risks arising from defence equipment co-operation must be set against the potential benefits. In committing to co-operative programmes, consideration must therefore be given both to the overall balance of risks and benefits, and to the balance between the types of benefit aimed for.

7 **Benefits and Risks of co-operation throughout the lifecycle**



Source: National Audit Office

Our study examines whether the benefits of co-operation are being maximised

1.14 Our study focuses on two issues:

- the economic and wider military, political and industrial benefits achieved by co-operation in the research, development, production and in-service stages of the equipment lifecycle (Parts 2 and 3); and
- the extent to which the Department's decision-making processes promote or hinder the maximisation of co-operative benefits (Part 4).

1.15 The main features of our methodology are summarised in **Figure 8**. Further details are provided at Appendix B. **Figure 9** shows how the methodology relates to the two study issues.

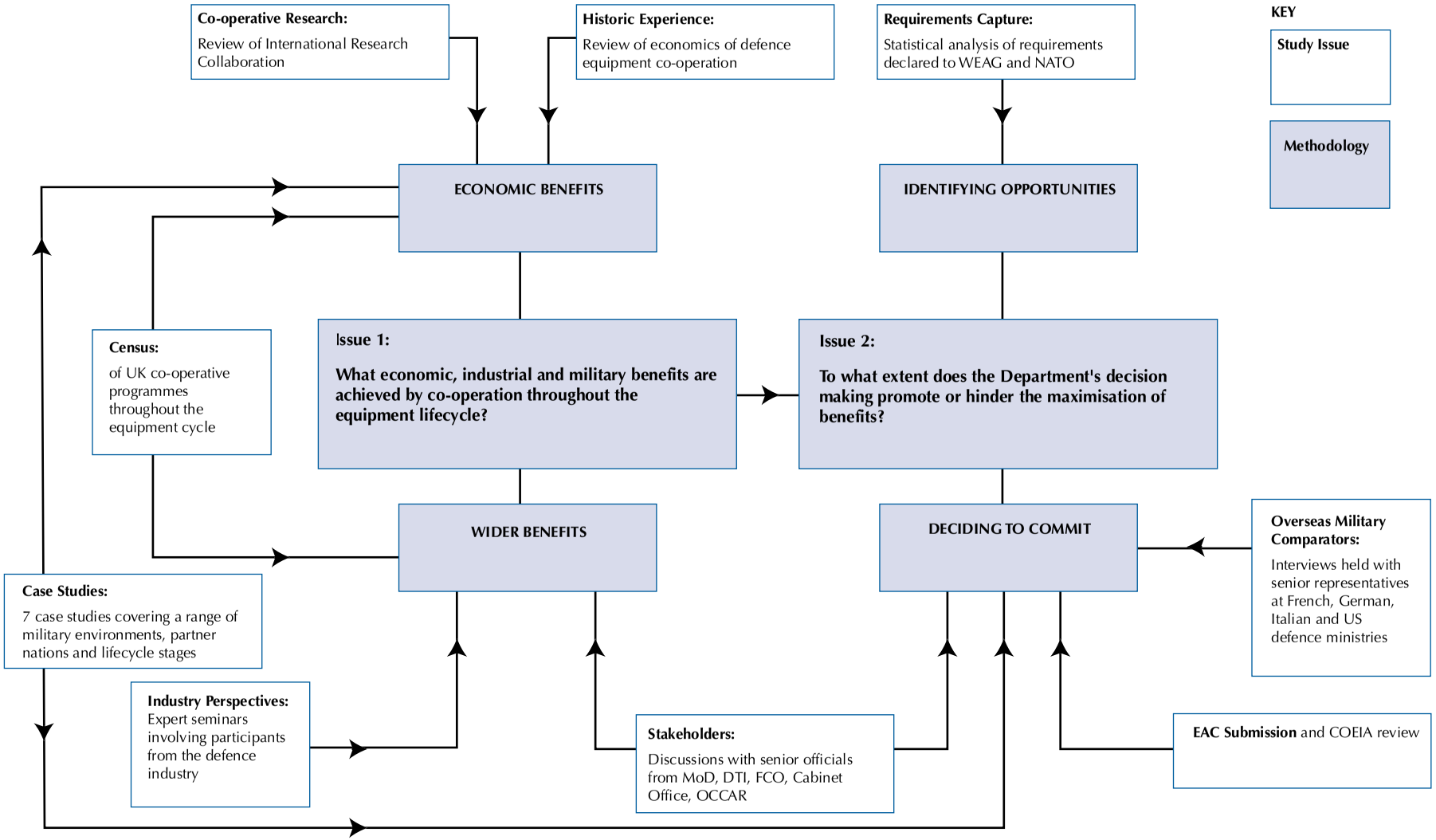
1.16 We would like to thank all those in the Ministry of Defence and other government departments, at OCCAR, in industry, in France, Germany, Italy and the United States and elsewhere who provided inputs into this report.

8 Main features of our methodology

Task		Description
(1)	Census	The census took the form of a postal questionnaire to managers of all co-operative equipments at the Defence Procurement Agency and in the Defence Logistics Organisation.
(2)	Case studies	Eight case studies were selected to include a range of military environments, co-operative partner nations and lifecycle stages. The principal focus was on the Common New Generation Frigate, Joint Strike Fighter and Multiple Launch Rocket System programmes, while studies of the WR21 Marine Engine, Spey Gas Turbines, TRIGAT, Anglo-French Helicopter Co-operation and DIRCM programmes have provided supporting evidence.
(3)	Overseas military comparators	Interviews were held with senior representatives at French, German, Italian and United States defence ministries and Defence Attachés/Defence Supply Staff at the British Embassies in these countries, to gain an understanding of other nations' perspectives of equipment co-operation.
(4)	Historic experience	HVR Consultancy Services were commissioned to review the economics of international defence equipment collaboration.
(5)	Discussions with key stakeholders within Government	We held discussions with senior Departmental officials (up to and including the Chief of Defence Procurement) and met with officials from the Department of Trade and Industry, Treasury, Foreign and Commonwealth Office and the Cabinet Office and OCCAR.
(6)	Review of EAC papers	We reviewed a range of Equipment Approvals Committee submissions and Combined Operational Effectiveness and Investment Appraisals to examine how the Department decides whether to co-operate.
(7)	Requirements capture	We undertook a statistical analysis of requirements declared to the Western European Armaments Group and NATO and interviewed key stakeholders.
(8)	Co-operative research	We commissioned University College London to examine the effectiveness of United Kingdom International Research Co-operation.
(9)	Industrial perspectives	We held expert seminars involving participants from the defence industry and met with the Defence Manufacturers Association and Society of British Aerospace Companies.

Source: National Audit Office

9 How our methodology relates to the study issues



Source: National Audit Office

Part 2

The benefits of defence equipment co-operation

2.1 This Part of our Report examines in more detail the potential economic, military, industrial and political benefits and also the principal risks involved in defence equipment co-operation.

(a) The cost effectiveness of defence equipment co-operation

Defence Research Costs

Co-operative research programmes provide an estimated fivefold return on the Department's investment

2.2 In terms of defence research, co-operation with partner nations should provide the Department with access to a wider technology base, prevent duplicated effort with allies and secure greater technological knowledge and understanding from the limited research budget. It should also provide a basis of mutual understanding and trust upon which to build future co-operative equipment programmes. Looking more widely, co-operative research with European partners has been viewed as a way of arresting the defence technological gap that has opened up between Western Europe and the United States. Equally, however, the long track record of co-operative research between the United Kingdom and the United States should be seen as an important product of the close defence relationship between the two countries.

2.3 The Department co-operates in international defence research in four main ways. These are shown at **Figure 10**, together with a summary of their potential benefits and drawbacks. In financial terms, the

10 The four main forms of international co-operative research activity

The four types of international research offer differing benefits and drawbacks

Type	Description	Benefits and Drawbacks
Joint Research Programmes	Two or more participating nations pool resources in a predefined technological area.	In 1998/99 the Department spent some £42 million – 7 per cent of the total research budget- on international defence research programmes and estimate they have obtained technology valued at approximately £200 million – a 5:1 return on investment Also unquantifiable benefits from the exchange of ideas and identification of further opportunities for co-operation Time-consuming to implement
Information Exchange Programmes	Exchange of information on an ad-hoc basis, typically achieved through exchange of papers and discussions at meetings, conferences, etc.	Very low cost since, apart from the cost of dissemination, the Department pay no more to swap information with partner nations than for the domestically-generated research. Quick to implement. Technology acquired largely of a background nature. Department estimate annual value of information obtained is approximately £280 million.
Personnel Exchange	Personnel are seconded to other national organisations.	Quick and relatively inexpensive to instigate. The time spent by foreign scientists on attachment to the United Kingdom (117 months in 1998) is broadly equivalent to the time spent by United Kingdom scientists on attachment abroad (106 months in 1998). Main benefit is technology transfer and tends to be often implicit rather than explicit and realised over the longer term.
Shared Facilities	Facilities are jointly owned or controlled by participating nations.	Significant upfront investment. Participating nations unlikely to be able to afford facility nationally so potential cost savings are high. Few examples. Those in operation tend to be under-utilised (eg the European Transonic Wind Tunnel and the NATO research ship "Alliance").

Note: The precise return on the Department's investment in co-operative research is difficult to establish. The returns quoted in this figure represent the subjective judgements of the Department's technical experts and are sensitive to changes in the assessment of the relevance of the research.

Source: University College London analysis commissioned by the National Audit Office

Department commits most heavily to joint programmes with other partner nations, which accounted for £42 million, or 7 per cent of the total defence research budget, in 1997–98. The return on the Department's investment is difficult to establish precisely, since it generally depends on an estimated valuation of the research benefits acquired. For joint programmes, the Department assesses that it obtains technology worth approximately £200 million against annual expenditure of approximately £40 million – a 5:1 return on its investment.

2.4 Information exchange programmes provide the Department with information assessed as having an annual value of approximately £280 million. Information exchange gives a potentially high rate of return because, apart from the cost of dissemination, the Department pays no more for the information it acquires from overseas than it has already paid for the domestically-generated information for which this is exchanged. The benefits of other forms of defence research co-operation are more difficult to assess in financial terms. The advantages gained through personnel exchange are often implicit rather than explicit and tend to be realised over the longer term. There are very few joint research facilities on which to base an assessment of the cost effectiveness of this type of co-operation. However, those that exist represent a significant investment that participating nations would find hard to afford on an individual basis (examples are the European Transonic Wind Tunnel and the NATO research ship "Alliance").

Development Costs

The Department has estimated that the overall costs of co-operative development programmes may be up to twice as high as for national alternatives

2.5 In the absence of similar national comparator programmes it is very difficult to assess whether co-operative development programmes are more economic than national programmes. However, some indication may be gained by comparing estimates of the total costs of co-operattive and national development options made at the time the Department was evaluating alternative sprogramme options. There are relatively few cases where such a like-for-like comparison can be made - often the alternative solutions were markedly different and we recognise that there is no way of establishing the reliability of cost estimates of options that were not adopted.

Co-operative factors played little part in cost overruns on co-operative development programmes

2.6 **Figure 11** provides details of five cases where we were able to carry out analysis, all of which show that the co-operative option was estimated to be at least a third more expensive in global terms than the national alternative. The realism of the original estimates of co-operative programme costs may be questioned in the light of subsequent cost overruns on three of these programmes. However, the results of our census suggest that the cost variance implications of co-operation are likely to be broadly neutral. Only two per cent (£145 million) of a total net cost overrun of £1.3 billion on all co-operative development programmes was attributed to co-operative factors. What is more, the overrun attributed to co-operation was wholly accounted for by 7 of the 31 programmes currently in the development or production phases. In particular, £100 million of the overall cost overrun was attributable to the re-definition of co-operative requirements arising from German concerns over Eurofighter programme costs. This suggests that the Department is successfully taking account of the cost penalties associated with co-operative development programmes in making their decisions to commit to them.

Co-operation offers the prospect of savings through shared development costs

2.7 Given that, in terms of their total cost, co-operative development programmes are usually more expensive overall than national ones, it is ultimately the savings

11 Estimated costs of comparable co-operative and national development programmes

Global cost estimates of development programmes increase with the number of co-operative partners.

Equipment	National Alternative	Number of partners	Global development cost as a percentage of alternative national development cost
Eurofighter	P120	4	196
Common New Generation Frigate	National development of a similar design	3	179
Tornado	National development of airframe and engine	3	161
Merlin Mark 1	United Kingdom national programme	2	143
TRACER	National development of a similar design	2	141

Note: Figures are those estimated at the time the programme was approved.

Source: National Audit Office

made by cost sharing with partners that makes such projects attractive in economic terms. On average the United Kingdom's cost share equates to one third of global development costs. Once again, this figure is heavily influenced by the Eurofighter programme. If Eurofighter is excluded the Department's share rises to 37 per cent, reflecting more closely the preponderance of bilateral and trilateral programmes.

2.8 For 70 per cent of co-operative programmes, development costs are either shared equally between participating nations (47 per cent) or in proportion to proposed off-take numbers (23 per cent). The precise arrangements tend to reflect whether the co-operation is with the United States or European partners, how programme decision-making and leadership is organised, and the motivations of the partners joining the programme. For example:

- On the TRACER armoured combat vehicle programme, the United Kingdom requirement is for 316 vehicles and the United States requirement is for between 1000 and 1500. To maintain an equal influence on the programme the Department is contributing 50 per cent of Project Definition costs and aim to carry this arrangement forward into full development. Conversely on the Joint Strike Fighter programme, the Department is contributing in the region of 10 per cent of the cost of the Concept Demonstration phase – sufficient only for it to have a limited influence in the conduct of the programme (see Case Study 3 on Page 57).
- On the EH101 helicopter programme, development costs have been shared equally between the two partners – the United Kingdom and Italy – despite the United Kingdom off-take being higher. In this case the driving motivation for Italy was industrial, a factor reflected in the decision to allocate workshare primarily on the basis of man-hours work rather than cost.
- Costs and work on the Tornado and Eurofighter programmes have been shared in proportion to declared off-take numbers. This has necessitated the renegotiation of cost shares and work shares and the reallocation of work packages as partners have amended their intended off-take quantities and to take account of the effect of exchange rate variations. For instance, United Kingdom workshare on Tornado rose from 42.5 per cent to 47.7 per cent when Germany reduced off-take numbers by 98 aircraft. On Eurofighter, all four participating nations have reduced their originally declared off-take numbers, but the United Kingdom proportionately less so than the other national partners, resulting in an increase in work share from 33 per cent during development to 37.4 per cent during production.

Production Costs

Co-operative production has not always been structured to maximise economies of scale

2.9 The principal economic benefits of co-operative production should come from economies of scale in manufacturing. For example, drawing on evidence from a range of defence equipment programmes and economic analyses, our consultants, HVR-CSL, have estimated that total defence equipment production unit costs could fall by up to 10 per cent as output doubles. However, achieving such cost reductions assumes production is undertaken in the most efficient manner, which has not been the case on many co-operative programmes. Efficiency has often been compromised by a rigid adherence to the principal of juste retour – where national cost shares on individual programmes and programme elements are precisely matched to national work shares – leading to the artificial splitting of work packages and their allocation other than on the basis of minimum cost. Additionally, concerns regarding security of supply, and nations wishing to obtain high technology work and protect national employment have led to the establishment of multiple production lines with corresponding losses of economies of scale.

Reducing order quantities adversely affects projected economies of scale

2.10 Economies of scale have also been compromised by partner nations either reducing order quantities or withdrawing from the production phase altogether. For example, in 1993 Germany reduced its requirement for Counter Battery Radar (COBRA) systems from 28 to 5. This reduction invalidated the maximum price production option offered by the contractor – EuroArt – and increased unit production cost by 25 per cent which would have made the programme unaffordable to all partner nations. Negotiating a cost reduction programme with EuroArt and obtaining national approvals for the programme led to a delay of 42 months.

Co-operative programmes achieve economies of scale likely to be in the region of half those on national programmes

2.11 Given that there can be obstacles to efficient production on co-operative programmes, HVR-CSL have estimated, on the basis of a statistical analysis, that the economies of scale achieved on co-operative programmes are likely to be in the region of half those on national programmes. It is difficult to confirm this figure, since there are few quantifiable like-for-like comparisons. However, indicatively, on the Multiple Launch Rocket System Phase 1, where parallel production lines were set up on a single-nation basis in the United States, and on a four-nation basis in Europe, unit production costs were initially comparable (Europe producing cheaper

launchers; the United States producing cheaper rockets). Subsequently, European nations have not succeeded in securing any third party sales while the Americans have sold rockets and over 200 launchers to 11 overseas countries. The Americans' success is thought to reflect the United States dominant position in the market, the more significant economies of scale from the United States production line and that there was less spare capacity on the European production lines.

Initiatives are underway to improve the efficiency of co-operative production.

2.12 There are signs on recent programmes that partners are becoming more pragmatic in structuring co-operative production and that affordability concerns are resulting in more rationalised production arrangements. For example, the Guided Multiple Launched Rocket System is currently in the early stages of development. The proposed procurement strategy takes into account lessons learnt from the initial procurement of MLRS and, although the partner nations will not enter into any binding agreements until development is complete, the principles for co-operative production have been agreed with the aim of achieving broadly equitable work share subject to value for money considerations. Affordability factors may also affect co-operative production arrangements even where there is limited commonality in the equipment being produced. For example, on DIRCM, the United Kingdom is lead nation in a co-operative development programme with the United States. While common development and non-recurring production costs are shared equally between the two partners, production costs are a national responsibility. Each nation has in place separate schedules in the United Kingdom managed contract with the manufacturer, Northrop Grumman, who will source their specific production requirements from common production facilities.

In-Service support Costs

Virtually all co-operative programmes include/expect to include some form of co-operative support

2.13 The costs of supporting an equipment once it has entered service account for a significant proportion of an equipment's through-life costs. Support costs are expected to account for some 50 per cent of through-life costs for the Joint Strike Fighter and 53 per cent for the Multi-Role Armoured Vehicle. **Figure 12** shows that all but four of the co-operative programmes in which the Department is involved either have, or intend to incorporate, some measure of in-service co-operation. The extent of co-operation depends on factors such as whether essential elements of the design or hardware have been sourced from a partner nation, the geographical separation of nations' equipments, different national equipment variants and the need to preserve fully independent operational capabilities.

Co-operative support offers economic benefits even where procurement was undertaken nationally

2.14 **Figure 12** also highlights that in-service equipment co-operation is not just limited to equipments acquired co-operatively. For example, the United Kingdom and the Netherlands are both acquiring derivatives of the United States designed Apache attack helicopter under national programmes customised to meet their specific needs. However, recognising the extent of commonality between the helicopters and the scope for co-operation the Department has signed Memorandums of Understanding covering potential common support arrangements and information exchange with both countries.

2.15 The economic benefits which can accrue from such co-operative support are well illustrated by the arrangements in place between the United Kingdom, the Netherlands, France and Belgium on Spey, Olympus and Tyne marine engines, which have resulted in annual savings of 30 per cent in the costs of Post Design Services and 20 per cent through the pooling of spares stocks on Spey marine engines. Other examples of successful co-operative support includes the Multi-Launch Rocket System (see Case Study 2 on page 55) and the Tomahawk Land Attack Missile. In the latter case, the United Kingdom support strategy was primarily driven by existing United States support arrangements and has benefited from the economies of scale through joint purchasing of spares and shared maintenance facilities.

12 The relationship between co-operative acquisition and support arrangements

12 out of 50 co-operative in-service support arrangements do not relate to co-operatively acquired equipments

Number of Equipments	With Co-operative Support Arrangements(1)	With No Co-operative Support Arrangements(1)
Acquired Co-operatively	38	4
Not Acquired Co-operatively	12	N/A

Note 1: For 10 equipments in the early stages of acquisition, it was premature to say whether or not co-operative support arrangements would eventually be in place. These equipments are omitted from the analysis.

Source: National Audit Office

There are a wide range of co-operative support arrangements in place although financial commitment is limited

2.16 **Figure 13** illustrates the diversity of co-operative support arrangements in place. The majority relate to Post Design Services, configuration control and joint modifications, with arrangements for fleet management and maintenance and logistic support less common. Indicatively, only 20 per cent of the equipments covered by our census and currently in-service incurred over half of their annual in-service support costs on a co-operative basis, and many older equipments had only very limited co-operation. In part this balance reflects nations' different operating and maintenance philosophies and national "customisation" of designs reducing commonality. For example, on Tornado, there was little in-depth analysis of the three partner nations' support requirements to back up development work, which nevertheless proceeded on the assumption that the three national air forces would operate the aircraft in a similar fashion. This has not been the case in practice and, as we noted in our report Modifying Defence Equipment (HC 24 1998–99), only 30 per cent of modifications to Tornado aircraft were common to all three partner nations. Similarly, on the linked Anglo-French helicopter (Puma, Lynx and Gazelle) programmes, common arrangements for equipment modification were set up despite limited analysis of each nation's operational and logistics environments. These have turned out to be very different from each other, placing strains on joint modification management.

2.17 Where the desirability of common support requirements has been recognised, reaching a solution acceptable to all partners may still be problematic. For example, on the Eurofighter programme, despite the ongoing assessment of logistic support issues throughout the development programme, differing operating and maintenance philosophies have meant that partner nations have been comparatively late in defining the scope for common support strategies. One consequence of this is that partner nations have been frustrated by the lack of detail in industry's tender responses for integrated logistic support whilst, for their part, industry have complained that their task had been complicated by nations' slowness in deciding between contrasting national support strategies. This issue is being addressed through plans recently put in place to ensure effective support of the aircraft when it enters service.

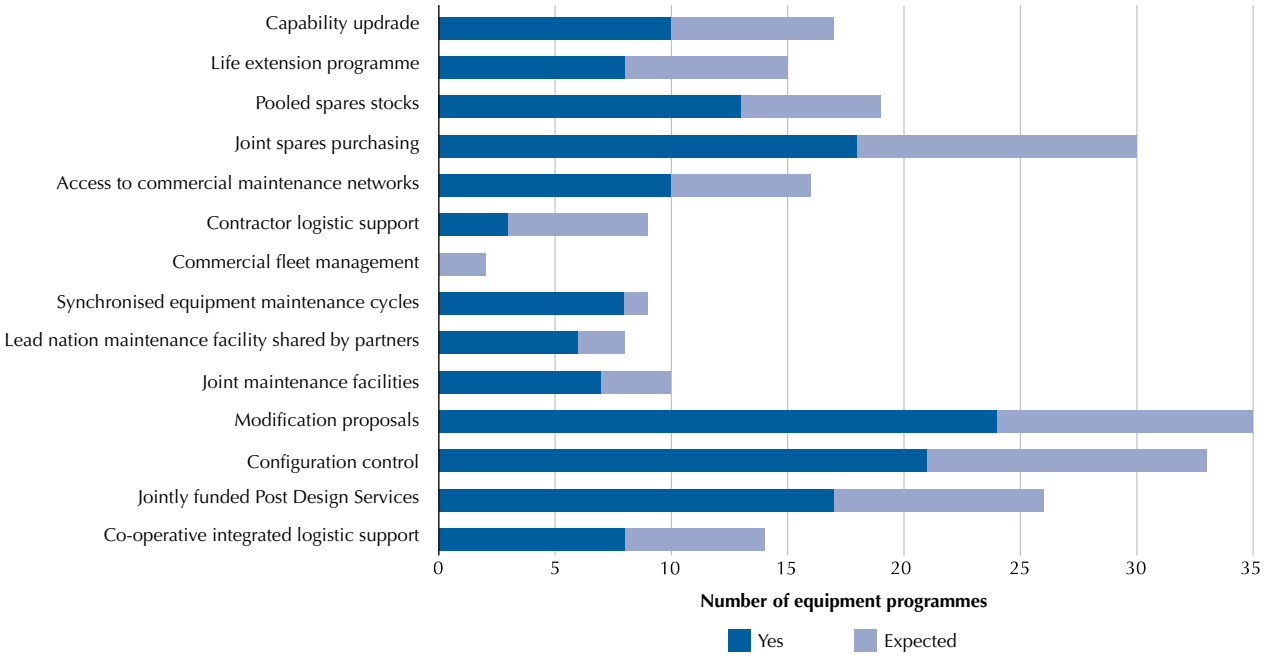
The effect of co-operation on acquisition timescales

Co-operative factors have caused an average of 11 months delay on co-operative acquisition programmes in which the Department are a partner

2.18 Whilst our analysis suggests that the Department is successfully taking account of the cost implications associated with co-operative procurement programmes, this is not the case with timescale penalties. Our census showed that procurement timescales on the 36 co-operative procurement programmes in which the

13 Types of co-operative support arrangement

There are a wide range of co-operative support arrangements in place



Source: National Audit Office

Department is currently engaged have slipped by an average of 28 months with some 11 months (39 per cent) attributed to co-operative factors. 23 projects were forecast to enter service late; 12 attributing slippage to co-operation. **Figure 14** highlights the wide range of co-operative factors which have led to delays and the following paragraphs explore some of the causes of programme slippage in more detail.

Industrial factors have been a major cause of delay

2.19 The most significant cause of delay – accounting for 78 months slippage across 6 programmes – is organisational. For example, on the Principal Anti-Air Missile System element of the Anglo-French-Italian Common New Generation Frigate (CNGF) programme, the weakness of the trinational Joint Venture Company resulted in a 19 month delay. This company was specially formed for the project. As such it had no separate commercial logic behind it – and it was difficult to establish as a successful prime contractor. Industrial factors also contributed directly to delays on the warship element of the CNGF programme, Project Horizon, and subsequently to the decision not to proceed with it further. The Department's stance was in part motivated by a lack of confidence in the ability of the Horizon trinational Joint Venture Company to deliver the programme, and industry's inability to restructure to address the Department's concerns. Further details of the CNGF programme are given in Case Study 1 on page 53.

Securing partners' commitment to the continuation of programmes takes time

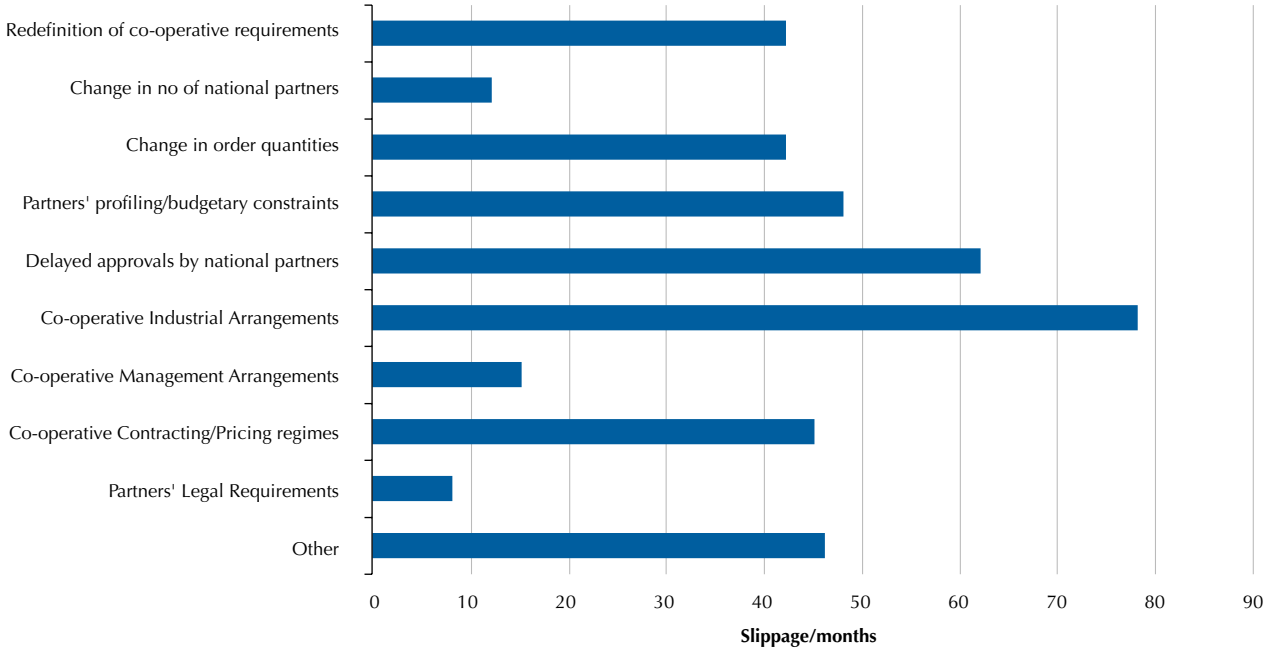
2.20 Two other important causes of slippage on co-operative programmes, accounting for slippage totalling 110 months across 7 programmes, are delays incurred while co-operative partners decide whether to commit to future phases of a programme, and delays in securing funding for future phases resulting from partner nations' financial profiles and budgetary constraints. For example, the Medium Range TRIGAT guided anti-tank missile development programme was delayed by two years because nations underestimated the length of time required to reach a satisfactory agreement on management and industrial arrangements for future phases and to obtain the associated national approvals.

Delays can be caused by partners withdrawing from the programme, or reducing order quantities

2.21 Decisions to withdraw from co-operative programmes, or to reduce order quantities, can also cause delays. The Aimed Controlled Effect Anti-Tank Mine, a rocket launched weapon under development by the United Kingdom, France and Germany, was delayed by eighteen months when France and then Germany withdrew from procurement. On the Long Range TRIGAT programme the Department decided not to commit to production because its guided weapon system requirements had changed. The Department remained in the development programme, albeit with reduced cost share, because to withdraw altogether would have been more expensive. A one year

14 Factors causing delays on co-operative acquisition programmes

Industrial arrangements and delayed approvals by partner nations are the main causes of slippage on co-operative acquisition programmes



Source: National Audit Office

slippage to the programme has been attributed to delays while the Memorandum of Understanding was re-negotiated to reflect the United Kingdom decision.

Achieving design commonality takes time

2.22 The Department's preference is to work for maximum commonality between partner nations' equipment requirements and to minimise the extent of national variants. As **Figure 15** shows, very few of the co-operative equipments currently in the procurement phase are expected to include United Kingdom national variants valued at more than 30 per cent of the United Kingdom cost share. At a working level, resolving differences between partners' detailed requirements to achieve this degree of commonality is often a difficult and lengthy process. On the Eurofighter programme, it took one year from the commencement of feasibility studies to agree performance characteristics for the aircraft and, a further three years to determine which parts of the requirement would be based on existing design solutions and which areas needed detailed development. By contrast, on the NATO Frigate Replacement and Advanced Short-Range Air-to-Air Missile programmes, no time was set aside to scope development and agree a detailed requirement after the performance characteristics had been agreed. The result was that when fundamental differences emerged the co-operation collapsed in both cases.

(b) The wider benefits of defence equipment co-operation

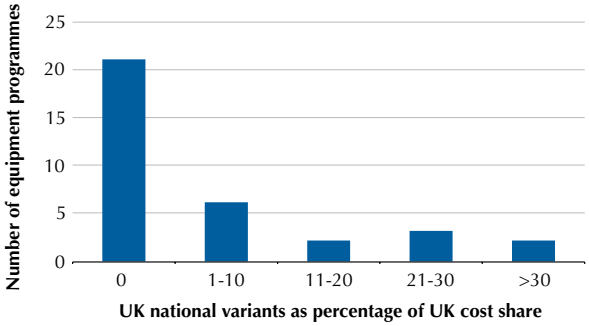
Co-operation generates military, political and industrial benefits

2.23 In addition to meeting military needs for defence equipment cost-effectively, there are a range of other military, political and industrial factors which influence nations' decisions to co-operate. In terms of the research to be generated or the performance of equipment to be acquired, the desired outcomes of co-operation are usually closely defined in the Memorandum of Understanding and associated documents. It is more problematic to define and measure some of the wider benefits of co-operation, given difficulties in quantification and the less concrete nature of objectives such as "contributing to European security and defence identity". In most cases, these difficulties have precluded any mention of the industrial and political dimensions of defence equipment co-operation in the relevant Memoranda of Understanding, although these may be important factors driving a nation's commitment to individual co-operative equipment programmes.

2.24 To gauge the impact of wider co-operative factors on equipment procurement programmes, as part of our census of equipment programmes, we asked project managers to state whether, compared to national alternatives, co-operation had had a positive or negative effect in terms of political relationships, military capability, equipment inter-operability and the defence industrial base. **Figure 16** details the responses we received. The consistent message emerging was that not only was co-operation expected to have wider benefits at the outset, but that, in the majority of cases, the actual benefits have been greater than anticipated. The following paragraphs examine the military considerations and political and industrial benefits in more detail.

15 United Kingdom national variants on co-operative programmes

Almost two-thirds of co-operative equipments are expected to have complete design commonality



Note: Information for the census was only available for equipments not yet in-service

Source: National Audit Office

Military considerations

Defence equipment co-operation brings military benefits, particularly from increased inter-operability

2.25 The end of the Cold War and changes in the global security environment have led to United Kingdom involvement in a growing number of joint and coalition operations which have placed an increasing emphasis on being able to harmonise equipment and operational capabilities with allies. Procuring and supporting equipment with partners can potentially bring military benefits, ranging from common equipment, access to a wider pool of spares in emergencies, enhanced inter-operability and the development of common military doctrine. An example of such co-operation is "Joint Ballistics" which is an artillery-systems user community set up to enable its members to fire each other's munitions from their own platforms. Previously concerned with basic weight and dimension issues, "Joint Ballistics" has successfully expanded its remit to promote the harmonisation of requirements in such areas as advanced fuses, gun-launched projectiles and range-correcting munitions. The importance of achieving higher levels of inter-operability has been emphasised by the NATO Defence Capabilities Initiative. This Initiative aims to improve defence capabilities to ensure the effectiveness of future multinational operations across the whole spectrum of Alliance missions, and has a focus on improving inter-operability across Alliance forces.

16 The wider impacts of co-operative programmes compared to national alternatives

Co-operative programmes have provided a range of non-economic benefits

Factor	Expected impact at outset			Outcome/current expectation		
	Negative	Neutral	Beneficial	Worse than expected	Expectation met/exceeded	Too early to say
	Percentage of projects responding[1]					
Political	0	24	76	2	70	28
Military capability	0	33	67	4	73	23
Interoperability	0	37	63	12	66	22
Industrial	4	36	60	9	69	22
Technology access	2	28	70	9	70	21

Note: 1. Responses were received from 70 per cent of projects. Those who did not respond were more mature projects where expectations during the procurement phase were difficult to guage.

Source: National Audit Office

There are challenges to extending inter-operability

2.26 The potential inter-operability benefits which should accrue from defence equipment co-operation have long been recognised, but there remain challenges to broadening their implementation. For example, the emphasis on digitisation - making equipments interface with each other as part of an overarching "system of systems" - carries the risk that, in being designed to a national digitisation plan, forces' equipments may be less accessible to allies and may not be inter-operable with their equipments. Recognising this challenge, officials in the United States emphasised to us the importance, consistent with security considerations, of exploring the scope for moving to "Open System" architecture for next generation equipment to preserve accessibility for partner nations' systems.

Industrial considerations

Co-operation provides an opportunity to build on existing skills and access new technologies and markets

2.27 The pace of technological change is accelerating. Companies need access to new technologies and new markets both to sustain existing capacity and to provide opportunities for growth. Co-operation is one method which may provide such impetus. In terms of access to new technology, the United Kingdom defence industrial base has, for example, benefited from access to electronic warfare technology and, potentially, some aspects of laser technology through industrial partnerships in the DIRCM programme. Conversely, co-operation may also result in United Kingdom industry sharing technical knowledge with potential competitors in other fields, such as advanced fuse technology. Co-operation may also provide a way to preserve existing jobs, skills and technological competencies. For instance, work on the Eurofighter programme has preserved existing skills bases and reinforced the United Kingdom's industrial competences in key technology areas such as airborne radar and defensive aids. Similarly, participation in the A400M aircraft programme will be important for BAE Systems to retain its leadership in wing design technology within the Airbus consortium.

2.28 By bringing together the strengths and marketing links of all of the partners, co-operative programmes can reduce the number of competing products and increase the prospects of securing export orders for high prestige co-operative projects. For example, recognising the benefits of approaching such sales opportunities from the co-operative angle - rather than individual partner companies attempting to secure sales as was the case on the previous Tornado aircraft - the four nation Eurofighter consortium has launched an independent marketing organisation to sell the aircraft.

Co-operation may provide a catalyst for industrial restructuring

2.29 By providing an opportunity to develop long-term relationships with potential partners, co-operation may also act as a stimulus to the global consolidation and more efficient operation of the defence industry. For example, strategic relationships have been formed between:

- GKN Westland and Agusta of Italy, based on their co-operation in developing and producing the EH 101 Merlin helicopter;
- Aerospatiale-Matra (France), DASA (Germany) and CASA (Spain) to form the European Aeronautics Defence and Space Company (EADS), building on existing joint helicopter and satellite projects in the case of Aerospatiale and DASA, and co-operation between DASA and CASA on Eurofighter.

Governments have recognised the part they must play in defence industry restructuring

2.30 In December 1997 the heads of government of the United Kingdom, France and Germany announced that "we are agreed on the urgent need to restructure the aerospace and defence electronics industries. This should embrace civil and military activities in the field of aerospace, and should lead to European integration based on balanced partnership". They added that "it is primarily for industry to work out the structure required. We undertake for our part to implement the necessary measures in national policies relating to this industry in order to facilitate such restructuring". In July 1998, Defence Ministers of France, Germany, Italy, Spain, Sweden and the United Kingdom signed a Letter of Intent designed to facilitate defence industrial restructuring in Europe. It identified six main issues to be addressed by specialist working groups tasked with identifying concrete proposals for removing some of the barriers to restructuring. The working groups reported in July 1999 and a Framework Agreement was signed in July 2000. Work is now under way to implement the Agreement.

2.31 In a parallel move, the United Kingdom and United States agreed a Declaration of Principles in February 2000 which acknowledged that past efforts to improve the level of defence equipment co-operation had not realised their full potential, and identified specific areas where both nations intended to seek improvements to the co-operative framework. The United States is now looking to reach similar agreements with other European and allied nations. The issues covered by the Letter of Intent and Declaration of Principles are summarised in **Figure 17**. If successfully implemented, the initiatives have the potential to address many of the difficulties which have been associated with defence equipment co-operation in the past and which are highlighted in our Report.

International political issues

Defence equipment co-operation can contribute to the achievement of wider political and security related objectives

2.32 Co-operation in the acquisition and support of defence equipment is inextricably linked with the achievement of wider political and security related objectives. For example, equipment co-operation with the United States is indicative of longstanding United Kingdom-United States defence and political relationships. Key relationships include those on the nuclear deterrent and Short Take-Off Vertical Landing aircraft where co-operation began with early versions of the Harrier aircraft in the 1950's and has continued with the initial phase of the Joint Strike Fighter development.

2.33 In Europe, moves towards closer defence co-operation are reflected both in the creation of a European Security and Defence Identity within NATO and in the European Defence Initiative within the European Union. Indications of the more practical steps which may be taken to achieve aspirations towards European Defence were given in the Helsinki European Council Declaration of December 1999 which "welcomed the recent progress made towards enhanced European defence industries", and "called for increased efforts to seek further progress in the harmonisation of military requirements and the planning and procurement of arms". Such associations mean that European partners often view United Kingdom policies on both co-operative acquisition projects and defence industry restructuring through the prism of the European Defence Initiative. This perspective was re-affirmed by United Kingdom embassy staff we interviewed who told us that all of our major European co-operative partners consider European political implications a key part of the decision-making process for equipment acquisition.

Conclusion

2.34 The potential economic benefits that defence equipment co-operation can deliver are well recognised. On joint research programmes, the Department secures an estimated five-to-one return on its investment, while on development programmes the Department benefits from aggregate expenditure three times the level of its own commitment. Co-operation is also increasingly seen to deliver cost-effectiveness benefits if applied selectively to the range of in-service support activities. In seeking to realise these benefits, we found that the Department successfully took account of the generally higher global costs of co-operative programmes that partly limited the economic advantage of such costs being shared between national partners. It was also working with partner nations to address the inefficiencies which have traditionally compromised economies of scale in co-operative production arrangements. But the Department has been less successful in taking account of the risks of extended timescales associated with co-operative programmes.

17 Major issues arising from the six nation Letter of Intent of July 1998 and the United Kingdom/United States Declaration of Principles of February 2000

Issues apearing in both the Letter of Intent and the Declaration of Principles.

1. Security of Supply
Establishing measures to ensure that governments and industry have confidence that security of supply of defence products will be maintained after industrial restructuring.

2. Export Procedures
Harmonisation and simplification of existing export control procedures to increase the confidence of governments and industry when procuring from overseas.

3. Treatment of Technical Information
Examining all aspects of intellectual property rights to ensure there are no constraints in this area to the efficient working of a restructured transnational defence company.

4. Security of Information
Establishing measures to ensure that classified information held by restructured companies is adequately protected while ensuring that security regulations do not constrain the ability of defence companies to restructure and operate.

5. Research and Technology
Examining methods to harmonise research and technology programmes, improve co-operation and ensure adequate funding, and sharing of costs, for research and technology.

6. Harmonisation of Military Requirements
Examining methods to better harmonise military requirements as a prerequisite to identifying projects at an early stage for co-operative research, development and procurement.

Additional Issues appearing only in the Declaration of Principles

7. Ownership and Corporate Governance
Encouraging the freest possible cross-border investment in defence-related industry and working to apply substantially the same standards in granting government security clearances to companies operating in one country but controlled by entities within another country.

8. Promoting Defence Trade
Working on a reciprocal basis to diminish legislative and regulatory impediments to optimising market competition.

Source: Six nation Letter of Intent Framework Agreement of July 2000; Declaration of Principles February 2000

2.35 We found that the wider political, industrial and military benefits of co-operation were also recognised, although there were practical difficulties in defining and acknowledging these at the programme level. Initiatives like the Defence Capabilities Initiative, Letter of Intent and the Declaration of Principles should create stronger building blocks for co-operation and help to ensure that future co-operation realises the potential benefits. In Part 3 of this Report, we consider how the realisation of both the economic and the wider benefits of defence equipment co-operation may be affected by the type of operational processes that characterise the co-operative environment, and how changes in that environment may impact on the benefits achieved.

Part 3

Co-operative planning and management processes

3.1 This part of our Report examines the processes by which co-operative activity is undertaken, and the effect that the adoption of particular processes might have on maximising the benefits and minimising the risks of co-operation. Recognising that defence equipment co-operation takes place over a wide range of different activities, it is in three main sections. The first section looks at current and prospective processes for identifying co-operative procurement opportunities through the harmonisation of equipment needs. The second section looks at departmental activity in realising the potential benefits of defence research co-operation. The third section looks at the management of co-operative equipment programmes.

(a) Harmonising equipment needs

Over 80 per cent of extant co-operative programmes were identified by "bottom-up" approaches

3.2 Opportunities for co-operation emerge when the defence equipment needs of one partner nation are similar to those of one or more partner nations. Aligning equipment needs has traditionally been achieved through two main methods: either "top-down" through high-level international fora which collate national partners' forward equipment plans to identify potential synergies; or "bottom-up" through working-level contacts, often between the national representatives to the high level international fora.

3.3 Our census found that the potential for co-operation on 83 per cent of the co-operative equipment programmes in which the Department is involved was first identified through the "bottom-up" approach. For example, there are extensive working-level contacts between United Kingdom and French naval planning staffs. Similarly, the United Kingdom's full partner status with the United States on the Joint Strike Fighter programme was built on a tradition of mutual visibility of each side's requirements and defence capabilities, dating back to co-operation on the Harrier aircraft in the late 1950s (see Case Study 3 at page 5). However, there are risks associated with the "bottom-up" approach. In particular, partners with potentially useful technical or financial contributions may be excluded and the potential inter-operability benefits of co-operation may not be maximised.

Few co-operative equipment programmes have been directly established through the "top-down" approach

3.4 The "top-down" approach is based on a number of international fora. The principal mechanisms are the NATO Conference of National Armaments Directors and the Western European Armaments Group which have been in operation since 1966 and 1976 respectively. The NATO Conference of National Armaments Directors maintains a database covering some 1,000 separate equipment needs declared by its 19 members and the Western European Armaments Group operates a database listing some 500 separate equipment needs declared by its 19 full member nations. The Conference of National Armaments Directors also provides the lead on industrial co-operation, standards development, and many of the other nuts and bolts of equipment co-operation.

3.5 So far, the "top-down" approach has met with limited success in directly generating co-operative programmes. For example, the United Kingdom has committed to just eight equipment programmes which have progressed to the Project Definition stage or beyond, although it should be recognised that among these successes have been achievements such as the A400M military transport aircraft programme and that the value of the Western European Armaments Group does not rest solely on the delivery of European Staff Targets. The NATO Conference of Armaments Directors has acknowledged that "armaments co-operation remains an ambitious, demanding and inherently slow undertaking" and has recognised that the current system of exchanging information on nations' forward equipment plans may not necessarily lead to greater numbers of co-operative programmes. The difficulties associated with the top down approach are illustrated by the fact that the only Outline European Staff Target (the first step in defining a common requirement) to be produced by a Western European Armaments Group

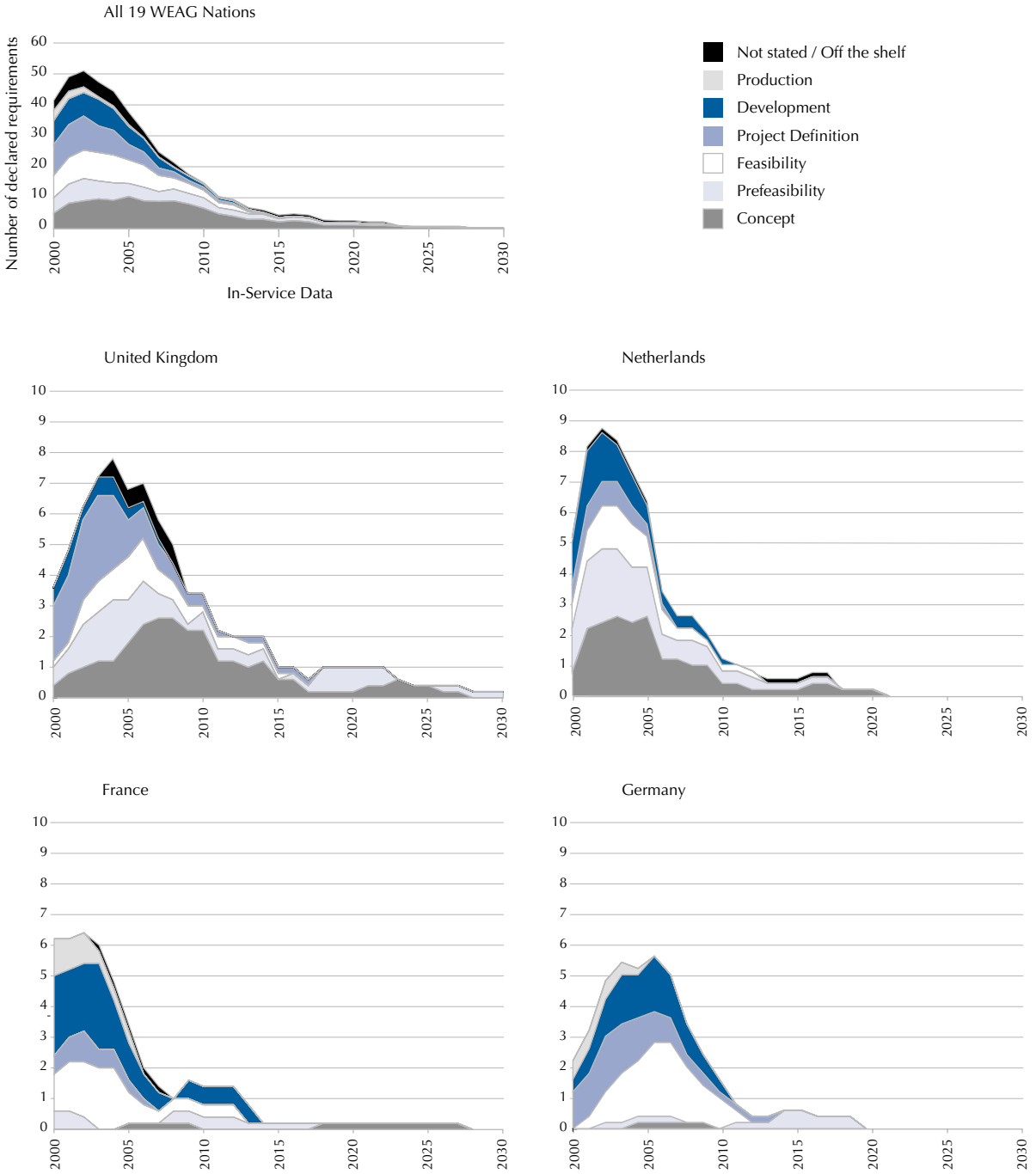
sub-group covering Short Range/Very Short Range Anti-Armour Weapons took six years to draft and, in the opinion of members of the sub-group, did not reflect any of the nine sponsor nations' actual requirements. The sub-group has now disbanded and the Outline European Staff Target is therefore unlikely to progress further.

Differences in national planning timescales, and funding and approvals processes adversely affect the identification of opportunities to co-operate

3.6 The relative lack of success of the Western European Armaments Group and the NATO Conference of National Armaments Directors in directly establishing co-operative programmes reflects in part differences in national planning timescales. For example, neither organisation has any set rules about how far in advance nations' future equipment requirements should be declared. Rather, the point at which potential requirements are declared is driven by separate national equipment planning processes. As **Figure 18** illustrates, the result of this approach is that there are marked variations between individual nation's equipment plans. For instance, requirements declared to the Western European Armaments Group by the United Kingdom include a large number still in the early concept stage, with in-service dates extending out to the year 2030, as well as a number of mature requirements predicated against earlier in-service dates. This pattern is roughly similar to the Netherlands forward equipment programme but contrasts with the French and German declared equipment programmes, which are dominated by mature projects. These differences reflect historically shorter French and German planning perspectives compared to those of the United Kingdom and the Netherlands, as well as nations' contrasting intentions in declaring equipment programmes to the international arena (for instance, marketing, technology transfer or cost effectiveness may be the underlying motive).

18 WEAG nations' declared forward equipment plans

There are significant variations between individual nations' declared forward equipment requirements



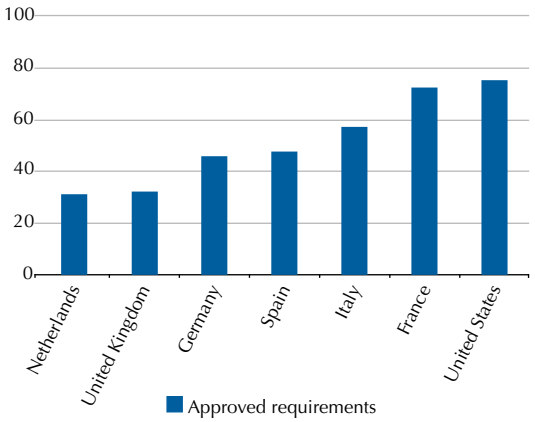
Note: Data analysed by prospective In-Service Date and current project phase

Source: National Audit Office Analysis of WEAG Database (as at 30 September 1998)

3.7 Differences in national approval processes pose additional obstacles to the likelihood of co-operative opportunities arising from the "top-down" approach. **Figure 19** shows that the proportion of requirements declared to the NATO Conference of National Armaments Directors which have secured formal national approval varies widely, from 31 per cent for the Netherlands to 75 per cent for the United States.

19 Proportions of equipment requirements formally approved by national governments

The proportion of declared requirements that have secured their governments' formal approval varies significantly between NATO members



Source: National Audit Office analysis of Conference of National Armaments Directors database

The "top-down" approach has encouraged co-operation below full programme level

3.8 Despite its limited success in establishing fully-fledged joint programmes, as **Figure 20** highlights, the "top-down" approach has furthered defence equipment co-operation in a number of ways.

There have been recent attempts to combine elements of the "top down" and "bottom-up" approaches

3.9 Recently, there have been attempts to combine elements of both the "top-down" and "bottom-up" approaches, to secure the advantages of each. The aim has been to provide a structured framework for addressing the harmonisation of forward equipment requirements between key players in the defence procurement arena, rather than globally across all potentially interested nations. This would encourage established partners to identify downstream co-operation opportunities in a rational and coherent manner. An example of such an initiative is the setting up of bilateral arrangements between the United Kingdom and France to co-ordinate each nation's work in defining future equipment needs. Similarly, enhanced arrangements for harmonising equipment requirements has been made an explicit commitment in both the Declaration of Principles signed by the United Kingdom and United States, and the Letter of Intent negotiated by the six principal Western European nations in terms of defence equipment procurement (see paragraphs 2.30 and 2.31).

20 How the "top-down" approach encourages defence equipment co-operation

Whilst it has had limited success in identifying co-operative programme opportunities the "top-down" approach provides a range of other benefits

Factor	Benefit	Example
Promoting inter-operability	Ensuring that nationally procured equipments are based on common international standards or design configurations	Nations are acquiring a number of different Aircraft Approach and Precision Landing Systems but arrangements have been put in place to ensure that the different equipments operate to common NATO standards
Identifying common component parts or sub-assemblies	Reduced acquisition and support costs and increased interoperability	The Western European Armaments Group, Future Bridging Equipment Sub-Group is working towards an exchange of information on commercially available or specialist components to meet common short-term requirements
Integrated support arrangements	Provides a forum for nations operating particular equipments to identify common support and upgrade requirements	The Western European Armaments Group, Main Battle Tank Sub-Group is effectively a "User Club" for nations operating the German Leopard Tank
Encouraging early consideration of "Next-But-One" Generation equipment	Encourage dialogue for next generation systems where it has not proved possible to harmonise nations existing requirements	The Western European Armaments Group, Future Armoured Vehicles Sub-Group has become a forum for discussions about replacements for Armoured Vehicles that are currently in development or production
Identifying areas of common interest and initiating working level contacts	By encouraging dialogue between nation areas as for co-operation may be identified which are then pursued outside the formal mechanisms	The Western European Armaments Group, Air Launched Weapons Sub-Group established that, of eight potentially interested members, France and United Kingdom shared the greatest commitment to co-operating further. France and United Kingdom are now pursuing co-operative opportunities under separate bilateral arrangements

Source: National Audit Office

Discussing future capability needs rather than specific requirements may assist in future efforts to identify opportunities for co-operation

3.10 Following the Strategic Defence Review the Department is developing a new method of capturing, engineering and managing requirements. This approach, known as "Capability Management", recognises that the Department's previous approach, as with the approaches followed by the United Kingdom's principal national partners, focused too much early attention on the precise characteristics of the equipment to be procured. Capability Management is based on defining the outputs which users require in a broadly framed Statement of Need with the System Requirement (what the system must do to meet user needs) only specified when the main investment decision is taken. France and Germany have been working separately on a similar approach called "Common Programming of Needs and Equipment" since 1996.

3.11 By providing greater flexibility in the formative stages of programmes, Capability Management provides a framework within which key partners can align aspirations in given areas of military capability and discuss the possibility of cost, schedule and capability trade-offs to overcome differing timescale and funding commitments. **Figure 21** highlights the range of different forms which co-operation may take given such a flexible approach to identifying co-operative working opportunities and differing levels of design commonality. It also shows how the range can be extended if, additionally, account is taken of the different ways that industry can contribute to the definition and provision of equipment needs.

21 How alternative forms of co-operation can help to align partners' aspirations

Alternative co-operative approaches reflect the varying degrees of design commonality aimed at by participating nations

Approach	Example
Maximising commonality of design.	On the United States/United Kingdom Joint Strike Fighter programme, the final Joint Operational Requirement Document will be derived from successively more detailed trade-offs of the programme cost, time and performance parameters during the early stages of development to derive three variants (of which the planning assumption for the United Kingdom is the Short Take-Off and Vertical Landing variant) which meet the needs of the Royal Navy, Royal Air Force and United States Air Force, Navy and Marine Corps.
The acquisition of elements of capability	The German/Dutch/Spanish Trilateral Frigate Co-operation programme and United Kingdom/France/Italian Project Horizon programme both emerged from the failed eight-nation "NATO Frigate for the Nineties" programme. The two programmes were to procure vessels with differing capabilities and characteristics and followed different procurement routes. The Trilateral Frigate Co-operation was based on the partners harmonising their respective national designs to share key elements of cost and risk whilst adapting existing national frigate designs and constructing the warships in their own yards. The first Frigates are expected to be in service with the German and Dutch navies in 2002. The participating nations have recently decided not to proceed further with the joint United Kingdom/French/Italian Project Horizon programme which was based on the premise of a single common design with minimal national variants. The Type 45 Destroyer - the Department's replacement for Project Horizon is scheduled to enter service in 2007.
Development of linked systems by individual nations to meet commonly agreed requirements	Under the Family of Weapons Agreement whereby the United States developed an Advanced Medium Range Air to Air Missile and the United Kingdom, Germany, Canada and Norway were responsible for developing - albeit unsuccessfully - an Advanced Short Range Air to Air Missile to commonly agreed requirements. The United Kingdom has subsequently developed the missile on a national basis and five European countries (Germany, Italy, Sweden, Norway and Greece) and Canada went on to develop the IRIS-T short range air-to-air missile.
Nations contracting individually with industry	France and the United Kingdom have placed separate contracts with the respective French and British subsidiaries of Matra BAe Dynamics SAS - a company jointly owned by BAE Systems and Lagardère SCA - for the development and production of Conventionally Armed Stand-Off Missiles. Each nation's separate requirements have been fully harmonised by Matra BAe Dynamics into a single common technical solution based on modifying the Apache Anti-Runway missile to meet particular French and United Kingdom needs. As well as leading on requirement harmonisation, industry is also responsible for selecting appropriate national procurement approaches to deliver the two contracts. A fully integrated Franco-United Kingdom management and engineering team supplies industry leadership in co-ordinating the programme.
Off-the-shelf acquisition of a developed equipment with scope for co-operative in-service support and modification	The joint Dutch, Belgian, Norwegian F-16 purchase falls into this category and represents a successful example of co-operative Off-the-shelf acquisition and in-service support. The United Kingdom buying into the German M3 Amphibious Bridging project part way through development, while not strictly "Off-the-shelf", is a good example of sharing development and support costs while building on the established defence expertise of one nation. If successful, this programme may provide a model for the partial segmentation of the defence market, building on each nation's defence industrial strengths.
Industry led support	Logistic support to nations deploying Leopard tanks and Marder Infantry Fighting Vehicles is provided by a subsidiary company of their German manufacturer, Krauss-Maffei Wegmann. However, such arrangements can be difficult to implement unless they are planned early in the equipment lifecycle before government-managed support arrangements are put in place or planned. For example, the recent United States decision to opt for Contractor Logistic Support arrangements for latest generation missiles of the Multiple Launch Rocket System may complicate longstanding United States/European government-run support arrangements for the current fleet.

Source: National Audit Office

(b) Co-operative defence research

3.12 Given the apparent benefits of international co-operative research programmes we tasked University College London to examine departmental processes for identifying, planning and establishing co-operative research opportunities, and for determining which research activity should be undertaken on a co-operative rather than a national basis.

There are several factors which limit co-operation in defence research

3.13 Opportunities for co-operative research are identified in two main ways. First, staff within the Department regularly attend international meetings at which opportunities for international research co-operation are discussed. Second, Defence Evaluation and Research Agency staff represent the United Kingdom on the technical panels of various bilateral or multilateral fora which provide a framework for information exchange as well as an arena where opportunities for co-operation are discussed. In practice, the scale of defence research co-operation arising from these contacts has been limited by:

- the overlap between the various multilateral fora which has led to competition for resources and the risk of duplicated research effort. In part this duplication reflects the differing political context and membership of the individual research fora;
- nations' reluctance to share technical information where this is perceived to be of particular military or industrial advantage or because it might introduce vulnerability (such as through countermeasures). For example, the more technically self- sufficient Western European nations are reluctant to enter co-operative research in electronic warfare, sensor systems and signature control for fear of undermining their capability lead and industrial advantage in these areas;
- the time taken to negotiate joint programmes. It may take up to two years to negotiate the necessary Memorandum of Understanding and a year to negotiate the relevant technical annex.

3.14 One result of these difficulties has been that despite the importance the Department attaches to certain co-operative work, international research co-operation, particularly joint programmes, has been seen as high risk. This message was emphasised by a 1998 report commissioned by the Department which noted "a lack of awareness of, and failure to appreciate, the value of International Research Collaboration projects among some Defence Research and Evaluation Agency (DERA) staff."

Efforts are being made to address the factors which have constrained defence research co-operation

3.15 The United Kingdom has recognised the need to address the factors which have tended to constrain defence research co-operation. This is explicitly acknowledged in both the six-nation European Letter of Intent Framework Agreement signed in July 2000 and in the United Kingdom-United States Declaration of Principles of February 2000 (**see Figure 16**). The Western European Armaments Organisations has been specifically instituted to place co-operative research contracts and the Western European Armament Group is currently finalising the "EUROPA" Memorandum of Understanding which will translate the research and technology principles agreed by the six Letter of Intent nations into a practical basis for improved co-operative research. The "EUROPA" Memorandum of Understanding is intended to provide greater transparency in the exchange of national research and technology plans whilst permitting nations to conduct co-operative research in smaller more manageable groups if they wish to do so.

3.16 These efforts have already promoted greater flexibility in securing partner nations' access to defence research. For example, in relation to the United Kingdom requirement for a Future Offensive Aircraft System, the United Kingdom and France have been progressing ways of co-operating on technology acquisition, placing the emphasis on the need for industrial teams from both countries to work together under a single contract placed by either Government. Other countries are also expressing an interest in joining this work. Similarly, the United States has joined the United Kingdom led TRITON trimaran technology demonstrator programme. National partners are also trying to make better use of existing testing and research facilities. For example, on the Guided Multiple-Launch Rocket System, the United States - who are leading the programme - have encouraged competition between their test ranges and facilities available in European partner nations, contributing to overall reductions in the cost of procurement support.

There is some explicit guidance to establish a framework for co-operative defence research

3.17 The Department's research policy requires the Defence Research and Evaluation Agency to undertake research on a case-by-case basis in the most cost-effective manner possible - whether nationally or co-operatively. To provide direction in the planning of their research programme, the Department has a Technology Strategy which addresses co-operative research issues. Building on this strategy, the applied research management manual includes a chapter on international co-operation. Similarly, the corporate research programme guidance paper gives general guidance on international co-operation supplemented by specific guidance on a technology group basis. The Technology Strategy does not, however, contain precise goals against which performance in the co-operative research arena can be measured. This is being addressed as part of the work on the "Tower of Excellence" model referred to in paragraph 3.21. The Defence Research and Evaluation Agency acts in accordance with the Department's guidance referred to above and does not have a separate strategy of its own for co-operative defence research.

3.18 The Department maintains a database which records the financial benefits obtained through information exchange agreements and joint programmes. However, because the evaluation is performed retrospectively, it does not contribute to the decision to embark on a particular co-operative research opportunity, nor provide a benchmark to assess the initially perceived benefits of co-operation against those actually achieved. Additionally, the methodology used in the database makes the assessed value of co-operative research programmes heavily dependent on a simple form of categorising their relevance. The Department plans to review the methodology it employs.

3.19 Based on output from the Department's database, **Figure 22** analyses the assessed rate of return on the Department's joint research programmes by technology area. It shows that there is a significant variation in return between different technologies. It also shows that, where there is a high rate of return, the United Kingdom does not necessarily fund a high proportion of its investment in the technology area concerned through co-operative programmes. Once confidence has been gained in the robustness of the data, information of this kind may assist the Department in forming a view on the current balance of co-operative research activity and in establishing future priorities. For instance, a technology area showing a high rate of return but a low level of co-operative involvement might encourage more investment to be made in co-operation programmes in this area, or - equally validly - lead to a better understanding of the impediments to increased levels of co-operation.

22 **Expenditure on joint programmes across technology areas, 1997-98**

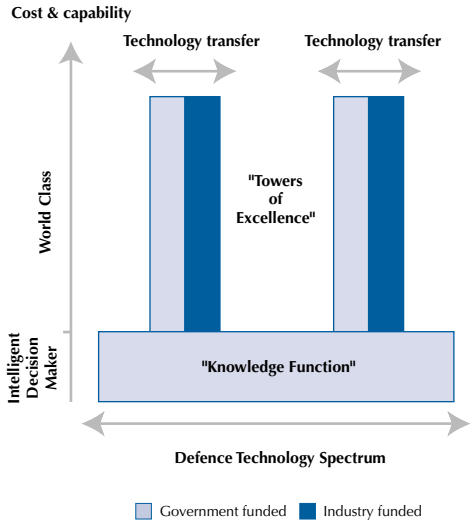
Technology	Co-operative programmes as per cent of total funding	Rate of return[2]
Lethality and Platform Protection	16.5	2.1 to 1
Structural Materials and Structural Effects	15.0	2.7 to 1
Human Sciences	12.3	1.7 to 1
Photonic/Optical Materials and Devices	12.1	3.0 to 1
Design Aspects - Platforms and Weapon	11.5	2.3 to 1
Chemical and Biological Materials	9.1	3.1 to 1
Electronic and Electrical Devices	8.2	1.7 to 1
Communications and system related Technologies	8.1	1.9 to 1
Sensor Systems	8.1	2.4 to 1
Energetic Materials and Plasmas	7.3	2.3 to 1
Computer Applications and information processing	4.5	20.4 to 1
Propulsion and Powerplants	4.1	3.8 to 1
Guidance and Control Systems	2.7	2.2 to 1
Computing Technologies	2.5	7.3 to 1
Electronic Warfare and Directed Energy Weapons Systems	2.2	2.9 to 1
ALL AREAS	**8.4**	**4.8 to 1**

Notes: 1. Technology areas reported are those in which the Department spent more than £0.5 million on co-operative research in 1997/98
2. Assessed Rate of Return = Assessed Value to the Department divided by United Kingdom expenditure

Source: University College London analysis commissioned by the National Audit Office

3.20 The Department has embarked on a number of initiatives which, although still in their formative stages, offer the potential to help in making decisions on which co-operative research opportunities to take up. At a national level the Department is developing a "Towers of Excellence" model to help focus research effort in selected areas. The model (illustrated in **Figure 23**) has, as the Department recognises, potential application for wider defence research co-operation following the formation of transnational defence companies. In the international environment, the Department has recently commenced annual bilateral Land and Air environment research reviews with the United States to review the spread of research and technological capability in different research sectors.

23 The "Towers of Excellence" model



The "Towers of Excellence" model recognises that the Department cannot afford to fund world-class research across the complete defence technology spectrum. Rather it must fund research sufficient to support intelligent decision-making on equipment capability levels. The model recognises defence-specific technology must be developed to the level required to produce world-class equipment in agreed areas - the "Towers of Excellence" - but, since not all of the knowledge generated within the "Towers of Excellence" is required for departmental decision-making, it need not necessarily be government funded. In such cases industry and other national governments may contribute the funding required to construct each Tower of Excellence, allowing technology to be transferred between the public and private sectors and internationally.

Source: Ministry of Defence

(c) The management of co-operative procurement programmes

There are a variety of potential industrial and government management arrangements for co-operative programmes.

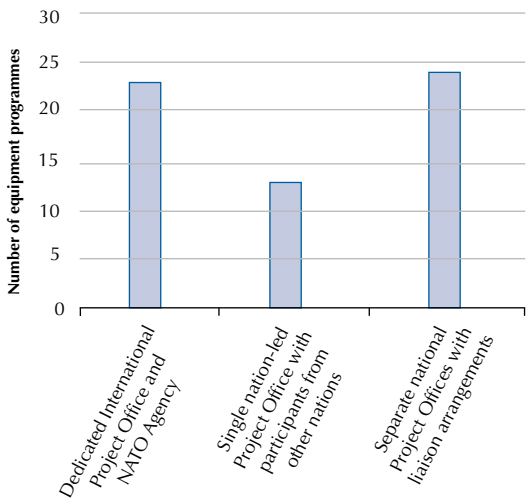
3.21 **Figure 24** illustrates the variety of industrial and government management structures put in place on the co-operative equipment procurement programmes to which the Department is currently committed. In industrial terms, approximately half of the programmes are led by existing companies, whilst specially formed industrial groupings are more prevalent on multinational European programmes and on the most significant transatlantic programmes. In terms of government management structures the position is broadly similar, with specially formed international management organisations on over a third of programmes.

3.22 **Figure 25** details the distribution of resources between national and international project offices and shows that, on just over half of the projects examined, the Department's own project office included more staff than United Kingdom staff numbers in the corresponding international project office. Of course, these figures do not take account of partner nations' staff in international project offices, nor does the split necessarily mean that management effort has been duplicated between national and co-operative project organisations. Rather, it partly reflects the fact that there are some tasks which may best be undertaken at a national level, such as securing management of national variants or integration with national programmes or, securing funding and approval from national authorities to progress programmes. Similarly, it may be more cost effective to draw specialist advice and technical services from national authorities rather than placing them under international management. National authorities have, however, sometimes found it convenient to supplement the formal government-industry interface between an international management agency and a multinational industrial consortium with informal links between their national project office and industry based in their own country. This has sometimes diluted the authority of the co-operatively established bodies in thei management of the co-operative elements of the programmes.

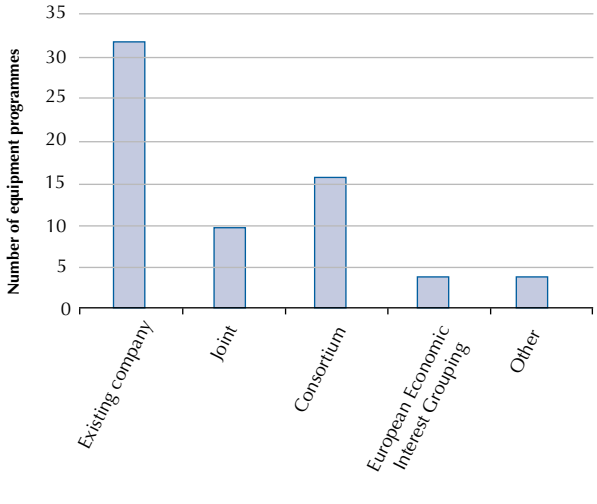
24 Government and industrial management structures

There are a range of industrial and government management structures in place on United Kingdom co-operative programmes

Government management structures



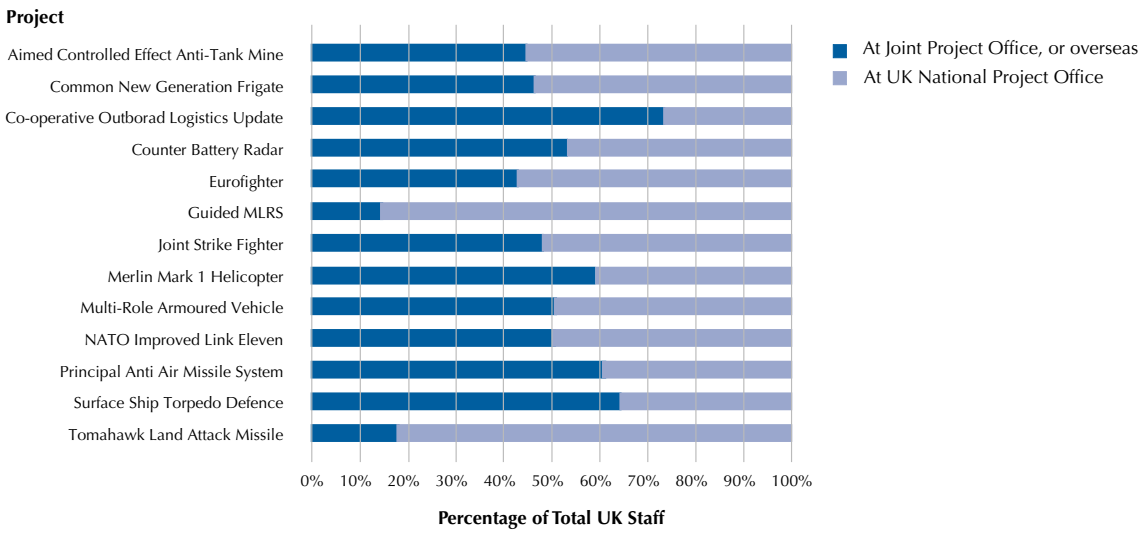
Industrial management structures



Source: National Audit Office

25 Distribution of UK staff between joint and national project offices

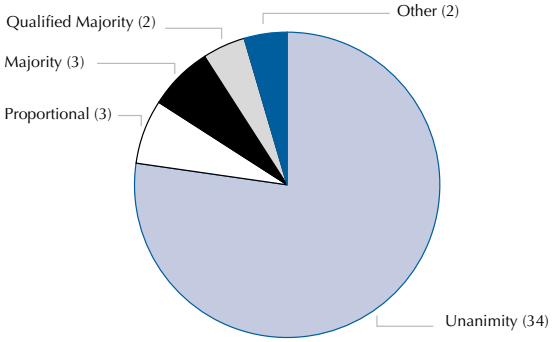
On over half the co-operative projects for which reliable data was available, staff working in UK project offices outnumbered UK staff in joint project offices, or overseas



Note: Projects shown are all those reporting reliable staff distribution figures from the census carried out by the National Audit Office

Source: National Audit Office

26 How decisions are made on co-operative programmes



Note: Reliable data on decision making processes were obtained for 44 of the 64 equipment programmes surveyed

Source: National Audit Office

3.23 In terms of decision-making, **Figure 26** shows that decisions on over three-quarters of co-operative procurement programmes involving the United Kingdom require unanimous agreement from the high-level multinational Steering Committee entrusted with oversight of the project, reflecting a desire to protect individual partner nations' interests. The problems experienced during the early years of the development phase of the Eurofighter programme illustrate the inefficiencies which may arise given the complex and bureaucratic management and decision-making structures necessary to achieving national agreements on issues such as work sharing on co-operative projects. Decisions were reached through a four level hierarchy of some 50 committees with consensus sought at every level. This meant that nations did not always make decisions in an efficient and timely manner, inefficiencies which were compounded because the NATO Agency charged with managing the programme did not have clearly delegated authority and responsibility and was not a clear focus for the management of the programme. These problems were mirrored by industrial management structures which meant that responsibilities and accountabilities on both sides became blurred.

Initiatives to improve management efficiency

3.24 The aim of the Smart Aquisition initiative introduced by the Department following the Strategic Defence Review is to "enhance defence capability by acquiring and supporting equipment more effectively in terms of time, cost and performance." As such, Smart Acquisition addresses the time, cost and quality problems which had previously characterised much of defence procurement and which were often exacerbated on co-operative programmes.

The Department has put a great deal of effort into explaining Smart Acquisition to its co-operative partners

3.25 Acknowledging that partner nations may not be fully aware of what Smart Acquisition means in practice, the potential benefits which it may hold, or how it may affect the United Kingdom's approach to co-operation, the Department has gone to great lengths to respond to partner nations' interest in its new approach. From our discussions in Europe and the United States it is clear that these efforts have been much appreciated and that the potential benefits - for example, in terms of a closer relationship with industry and greater scope to make trade-offs between cost, time and performance goals - have been recognised by some of those involved. However, it was clear that concerns remain, particularly among some partners in Europe. For example, the fact that, under Smart Acquisition, United Kingdom participation in the early stages of a co-operative programme is for the purpose of option evaluation and does not necessarily imply participation in a later stage, has led some to agree that it shows an uncertain commitment to a co-operative programme. Yet all countries must start from their own analysis, developing it into a co-operative framework. In this context we note that the United Kingdom too has suffered when its partners have decided not to continue to the next phase of a programme.

3.26 A number of those we met in undertaking the study, both within and outside the Department, argues that the appointment of Integrated Project Team Leaders individually accountable for delivering programmes against defined cost, time and performance targets could lead to an in-built prejudice against co-operative solutions perceived as being of greater risk. Countering such views, the Department has pointed out that its revised approach arises from reduced tolerance of cost and time overruns on equipment programmes, irrespective of whether equipment is to be procured under a domestic programme or as part of international co-operative arrangements. Furthermore, affordability and value for money are key elements in every Integrated Project Team's aims and both should be encouraged by co-operation, just as meeting more prominent interoperability and other requirements harmonisation factors point towards co-operative solutions.

3.27 The following paragraphs examine a number of initiatives and changes in the acquisition environment which hold the prospect of improving on previous inefficiencies, and examine the extent to which these align with Smart Acquisition principles.

OCCAR offers the opportunity for significant improvements in the efficiency and effectiveness of European co-operative procurement

3.28 The single most important initiative is the creation of the Organisation Conjointe de Coopération en matière d'Armement (OCCAR) in November 1996 by Germany, France, Italy and the United Kingdom. The Organisation was established with the aim of becoming "the preferred choice for management of new armaments programmes and a model example of European integration". It will achieve this by offering "professional programme management, resulting in optimum equipment performance, cost, and delivery timescales, whilst reducing the level of management risk and cost to a level which rivals that of individual national procurement organisations". In September 1998, the participating nations signed the OCCAR Convention which, once ratified, will provide the organisation with its own legal identity. Full legal status is expected early in 2001 after which OCCAR will be able to place contracts and manage co-operative acquisition programmes in its own name and to recruit and employ its own staff.

3.29 The Department's expectations of OCCAR are for it to build up an established framework from which to launch future co-operative programmes on best value-for-money principles. Instead of "reinventing the wheel" for each new co-operative programme, OCCAR will be expected to develop a portfolio of management techniques based on international best practice. The Department hopes that OCCAR will reduce cost and programme risk on the projects it manages to levels which rival those of national procurement organisations. The effective implementation of the OCCAR management procedures which are currently being finalised will be key to achieving this objective. These procedures will be analogous to the Department's own Acquisition Management System, and will be based in many respects around the "Smart Procurement" principles of integrated project teams and a whole-life approach to acquisition.

3.30 The key principles on which OCCAR will operate are listed at **Figure 27**. Given the wide-ranging scope of these principles, discussions are continuing on how to translate them into practice. For example, the principle of reciprocity - whereby bids from suppliers from non-member states are matched by bids in the suppliers' market being opened to companies from the OCCAR nations - is a response to the recognised need to develop a fair and open global defence equipment market. But dogmatic application of this principle could limit nations' freedom of action to procure, through global competition, equipments which cost effectively meet their agreed military needs. Similarly, "global balancing" is a major step forward from the inefficiencies associated with the previous practice of establishing precisely matched work shares on individual programmes. However, the detailed arrangements for calculating and monitoring global balance and correcting imbalances have yet to be agreed. OCCAR nations have undertaken to review the arrangements after three years.

27 The principles against which OCCAR has been established

- **Global Balance**

  The OCCAR nations have renounced the principle of "juste retour" (where national costshares on individual programmes are precisely matched to national workshares) in favour of "global balance" where national workshares are balanced over a number of programmes. This should permit greater freedom in supplier selection and help maximise the benefits of co-operation. Progress towards unrestricted competition may be further advanced by a review of global balancing arrangements three years after OCCAR receives legal status.

- **Flexible Voting**

  OCCAR has introduced a system of qualified majority voting for decisions related to its central operating policies (how decisions are made on individual programmes will be determined on a case by case basis by those involved). For a transitional period of at least three years, the founding nations will have a right of veto. Flexible voting already works well in organisations, such as the European Space Agency, and should help improve the overall efficiency of OCCAR management.

- **Competition**

  OCCAR contracts will be placed on the basis of competition. Whilst there is no declaration of exclusivity for European solutions each member state will "give preference to equipment in whose development it has participated within OCCAR". The aim is to facilitate a strong and competitive European defence industrial base while at the same time maintaining the possibility of global competition.

- **Reciprocal Access by non-European Nations**

  Bids from companies in non-member states will require unanimous agreement from participants in the programme concerned and would be subject to the principle of reciprocity (ie the suppliers' market should be similarly open).

- **New Members**

  OCCAR is open to other European nations, subject to their commitment to a major project involving at least one of the OCCAR partner nations and acceptance of principles underpinning OCCAR. An application from the Netherlands has been accepted subject to a programme participation. Other nations have also expressed interest in participation in OCCAR.

Source: Ministry of Defence

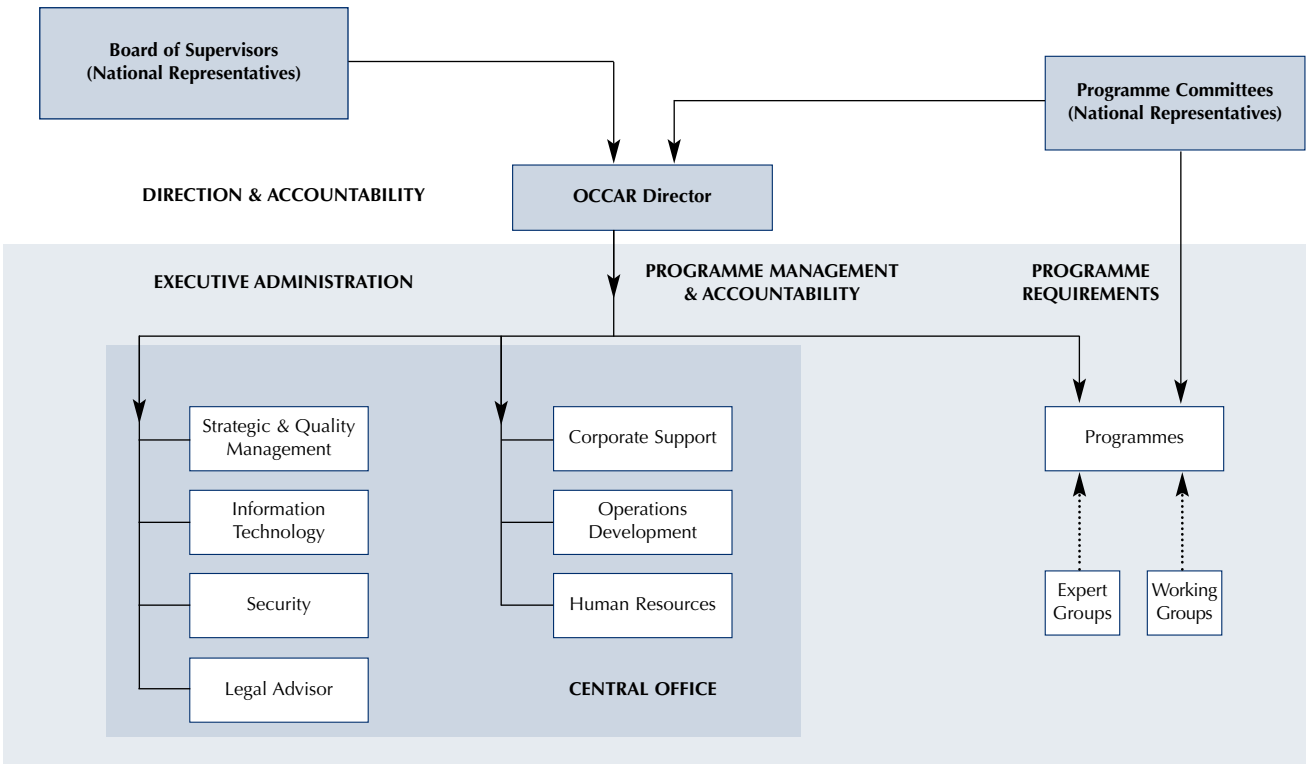
3.31 **Figure 28** shows the (post-legal status) organisational structure of OCCAR Whilst key corporate activities will be conducted by the Central Office, there will be a high level of delegation to the Programme Divisions. In principle, such delegation should be matched by a corresponding delegation of authority from nations and should result in improved programme efficiency. The interface between the OCCAR Programme Divisions (in Smart Acquisition language "the supplier") and nations ("the customer) will be through Programme Committees. How these relationships will operate in practice is unclear, but there are early signs that OCCAR is delivering tangible benefits. For example, in placing the Counter Battery Radar (COBRA) programme under OCCAR auspices the United Kingdom has reduced its national project staff numbers by over a half.

3.32 Assessing the success of OCCAR will take time. Initially only a number of Franco-German programmes which had reached an advanced stage of the acquisition cycle were integrated into OCCAR. The first programme involving the United Kingdom, COBRA, was integrated into OCCAR in February 1999 when the commitment was made to the production of the equipment. On all of these programmes the managerial arrangements were already well established and the impact of OCCAR procedures and principles will therefore be limited. However, in December 1999, the Multi Role Armoured Vehicle (MRAV) programme was also integrated. MRAV is only at the beginning of the development phase and its progress will offer an early opportunity to assess whether OCCAR can bring significant improvements to the management of co-operative programmes.

There are encouraging signs of more effective co-operation elsewhere, particularly with the United States

3.33 It is envisaged that OCCAR will not cover mature United Kingdom programmes, those involving exclusively non-OCCAR partners (in particular the United States) or programmes currently managed by NATO Agencies (such as Eurofighter). Change on these programmes is more likely to be characterised by a gradual, case-by-case approach. In some cases, particularly on more mature programmes, the scope for improvement and the potential benefits accruing may be limited and may not command the support of all participating nations. Such cases are the exception rather than the rule and there are signs of improvement in the conduct of some United Kingdom-United States and NATO-led programmes. For example, on the United States/United Kingdom Tactical Reconnaissance Armoured Combat Equipment Requirement (TRACER), the United States have agreed to follow United Kingdom procurement practices during Project Definition.

28 **Structure of OCCAR (post-legal status)**



Source: Ministry of Defence

3.34 When the NATO Eurofighter and Tornado Agencies were merged to form the NATO Eurofighter and Tornado Management Agency (NETMA) in 1996, the structure of the Agency and its supporting committees were reviewed and the Agency's Charter revised to facilitate more effectively focussed and timely decision-making. Similarly, the accountability and efficiency of the Agency has been improved through the introduction of performance reporting arrangements. The Agency has also introduced new working practices such as risk management, and is undertaking a range of business improvement initiatives.

On recent programmes through-life aspects are being considered more rigorously

3.35 There are also signs that, on more recent programmes, the Department and their co-operative partners have begun to place more emphasis on proactive planning for co-operative in-service support during early procurement phases. On the Joint Strike Fighter programme, a Logistics Advisory Council was formed in the Concept Demonstration phase to provide guidance to the Programme Office on the definition of a joint United States/United Kingdom support policy. Similarly, in common with seven other projects still in the procurement phase, the industry contractors (Rolls Royce and Northrop Grumman) on the WR21 gas turbines programme are closely involved in setting up logistic support arrangements, and in committing to support the equipment once it enters service.

Conclusion

3.36 The processes adopted for planning and managing co-operative activity affect the potential for realising co-operative benefits to varying degrees. In harmonising national partners' equipment needs, formal "Top Down" processes have historically been compromised by differences in partner nations' forward programming. However, recent initiatives - including the adoption of "Capability Management" - offer the prospect of the better identification of the potential for co-operation while retaining a structured approach. In the defence research area, recent initiatives have been set in train to address some of the factors limiting co-operation in defence research. In terms of co-operative procurement programmes, there has been considerable variety in both governmental and industrial management arrangements. The establishment of OCCAR, and initiatives in programmes involving the United States, demonstrates a commitment of the United Kingdom and its main partner nations to making co-operative management more robust.

3.37 The restructuring of the defence industry following the end of the Cold War has produced a smaller number of companies, certainly at the prime contractor level, but most of them have a wider range of capabilities, operate in more countries than their predecessors and some of them have the financial resources to assist in Private Finance Initiative and Public Private Partnership schemes. This industrial restructuring is itself a source of potential defence equipment co-operation-, encompassing research, development, production and through life maintenance and support. Indeed, co-operation may be easier to start at the industrial than the government level, and we recommend that the Department should pay particular attention to the scope offered by cross-border industrial capabilities and partnerships in fostering its equipment procurement programme.

Part 4

Deciding to co-operate

4.1 This part of our Report examines how the Department weighs up the risks and benefits of defence equipment co-operation to arrive at decisions on whether to join major co-operative acquisition programmes and examines the differences between the decision-making approaches adopted by the United Kingdom and those of its principal co-operative partners.

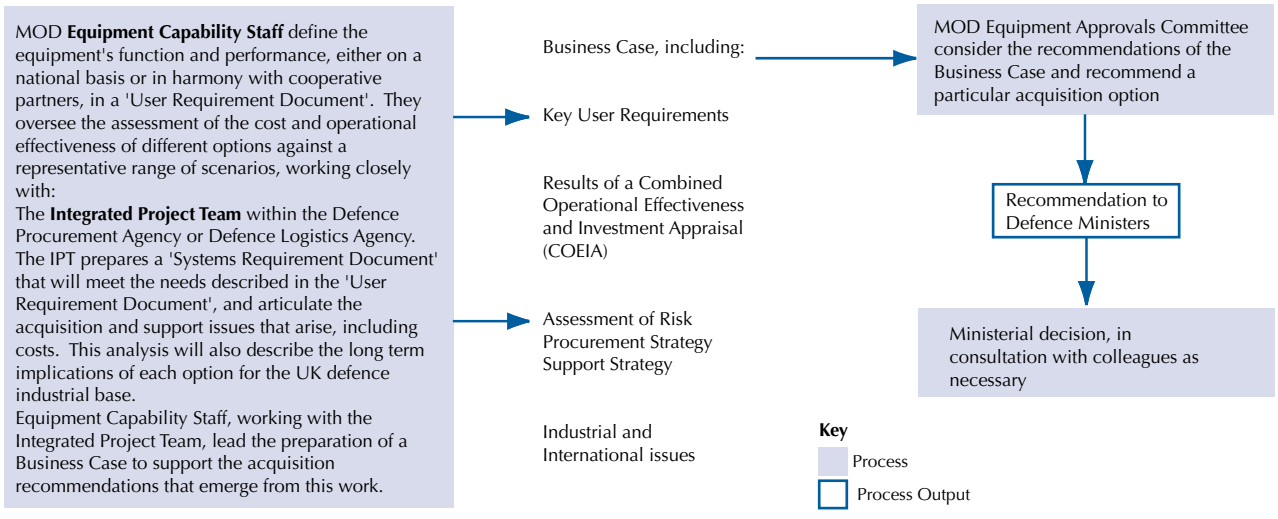
(a) Deciding to commit to co-operative programmes

There is a structured system to inform decisions on which acquisition route to follow to meet a given requirement.

4.2 **Figure 29** illustrates the typical United Kingdom decision-making process for a major defence acquisition programme. It shows that decisions on whether to approve (or reject) cases for investment in major projects are usually taken by Defence Ministers, although in recent years approximately six decisions each year have been taken by Ministers collectively. Defence Ministers base their decisions on advice from the Equipment Approvals Committee. The Committee comprises the Chief Scientific Adviser (who chairs the Committee), Vice-Chief of the Defence Staff, 2nd Permanent Under-Secretary, Chief of Defence Procurement and Chief of Defence Logistics. The role of the Committee was made explicit in evidence given to the House of Commons Defence Committee (6th Report, Session 1999-00) by the Chief Scientific Adviser. He said:

"The bottom line for EAC is really value-for-money. It is the assessment of the technical capability, costs of the project, in-life costs and so on. We do include as part of the advice that we give to Ministers views that may come from other Government Departments … and elsewhere on relationships between the impact of the particular decision on European industry and American industry and so on … Ministers may well give a different emphasis to some of those elements, and that is their job to do so … Our advice must be comprehensive and make clear those broad issues".

29 The typical United Kingdom decision-making process for the major investment decision of a defence acquisition programme



The capability and costs of alternative options are quantified

4.3 For equipment projects, the Equipment Approvals Committee bases its analysis on a business case prepared by the military customer and the leader of the Integrated Project Team within the Defence Procurement Agency or the Defence Logistics Organisation responsible for the acquisition of the equipment. The business case includes the results of operational analysis and investment appraisal - known as a Combined Operational Effectiveness and Investment Appraisal (COEIA) - together with analyses of the advantages and disadvantages and the potential benefits and risks of alternative solutions.

Defence industrial and wider factors are also considered

4.4 The Department does not believe that defence industrial and other wider factors can always be readily quantified and they are not included in the COEIA. However, in deciding whether a potential programme offers the best value-for-money, the Department does take into account wider factors such as whether the supplier base is efficient, competitive, and capable of meeting immediate and longer-term defence needs. The Department's guidance also states that, whilst macroeconomic factors such as changes in employment (which the Department quantifies in some cases) should always be brought to the attention of Ministers, they should not be given specific weight in individual acquisition analyses.

4.5 The Department's analysis of the wider issues surrounding defence equipment decisions is informed by consultation with other interested government departments. In addition to consultation on specific programmes, since 1997, there has also been a rolling programme of regular meetings between senior staff in the Department, the Foreign and Commonwealth Office, HM Treasury, the Department of Trade and Industry and the Cabinet Office to discuss the forward equipment programme, identify programmes of particular interest, and co-ordinate advice to Ministers.

4.6 The 1999 Modernising Government White Paper observed that the foreign and security policy area was already one of the most "joined-up" in government and much of the Department's decision-making process for major defence acquisition programmes reflects this approach. The importance of building on the existing jointery was emphasised in a letter which the then Secretary of State, George Robertson, sent to senior staff in the Department and the Armed Forces when the Modernising Government White Paper was issued. The letter emphasised that

"*we also need to involve people in other government departments, in industry, in the voluntary sector, so that our policies are "joined-up" to meet the overall needs of the country not just narrow departmental objectives*".

4.7 Achieving the objective set by the then Secretary of State may be helped by the revisions to the terms of the Accounting Officer Memorandum made in April 2000 to ensure it reflects the tenets underpinning Modernising Government. In particular, the revised Memorandum states that:

"An Accounting Officer should ensure that the impact of departmental activities on others is properly identified and where appropriate taken into account. For example, it might be decided that a department should contribute to a joined-up activity led by another organisation (whether in the public or private sectors) and that, even though this would not directly contribute to the achievement of the department's own objectives, it should make the contribution in view of the impact it would have on the achievement of the other organisation's objectives. The Accounting Officer will need to show that the participation represents good value-for-money overall and that appropriate controls are in place to safeguard propriety and to provide proper accountability. Similarly, an Accounting Officer should ensure that the organisation's staff are as conscientious in their approach to costs not borne directly on the department's Votes (such as costs incurred by other organisations or the Exchequer's financing costs eg relating to banking and cash flow) as they would be were such costs directly borne".

Most procurement decisions involving a co-operative option reflect the outcome of the COEIA, although in some cases the outcome was affected by wider factors

4.8 We examined high-level papers relating to 17 recent major procurement decisions involving a co-operative option to establish the key factors influencing the decisions made. The results are summarised in **Figure 30**. The key messages emerging were:

- In eleven cases the outcome of the COEIA provided a clear basis upon which the Equipment Approvals Committee could advise Ministers on which option to select. For example, the COEIA for the Production phase of the Eurofighter programme assessed the next best option - direct purchase of the Boeing F15E aircraft - as being less operationally effective and much more expensive in lifecycle terms;
- All seventeen decisions included some consideration of industrial and wider factors but only seven cases were supported by quantified analyses. A good example is the MRAV business case analysis where demand-side and supply-side trends in both the United Kingdom and the European armoured vehicles sector were modelled in order to assess the industrial implications of alternative procurement decisions;

Box 1: The decision to commit to development and production of the "Meteor" Beyond Visual Range Air-to-Air Missile

In 1995 the Department invited tenders for a Beyond Visual Range Air-to-Air Missile (BVRAAM) to equip the Royal Air Force's Eurofighter aircraft. Bids were received from a European consortium led by Matra BAE Dynamics and from the United States company Hughes (linked with European companies including Thomson Thorn and Shorts). Both bids contained areas of technical risk which the Department addressed by placing parallel Project Definition and Risk Reduction contracts in 1997. Revised bids were submitted in 1998. The Matra BAE Dynamics led consortium proposed the 'Meteor' and Raytheon Systems Ltd (who had acquired Hughes) offered a full capability solution called FMRAAM and an interim solution called ERAAM (Extended Range Air-to-Air Missile). Subsequently, Raytheon, in conjunction with the United States Department of Defense, offered an alternative interim solution (ERAAM+) with the possibility of upgrading to a full capability solution (ERAAM++) at a later date.

By the time the revised bids were submitted there was substantial wider European interest in the outcome of the United Kingdom competition. The other partners in the Eurofighter programme (Germany, Italy and Spain) were keen in principle to associate themselves with the United Kingdom requirement, as were France (for the Rafale fighter) and Sweden (for the Gripen fighter). All nations expressed an interest in co-operating in the development of the Meteor proposal.

The outcome of the COEIA was finely balanced and the Department's analysis also reflected wider considerations. Notably:

- ERAAM+ which would not meet the full requirement, nevertheless represented a unique opportunity for the United Kingdom to participate as an equal partner with the United States in the development of an existing successful missile programme with clear prospects of longer-term co-operation. As regards other European nations' interest, some countries might choose to acquire ERAAM+ but they would not be equal partners in the programme according to the terms offered by the United States to the United Kingdom. According to Raytheon, procurement of ERAAM+ would secure nearly 1,000 jobs at United Kingdom sites, although the Department considered these to be of generally lower quality than jobs resulting from the Meteor bid.
- Meteor would meet the full requirement, it was also particularly well matched to Eurofighter, and costs would be shared with up to five partners. Selection of Meteor would assist the prospect of consolidating the European guided weapons industry. Industrially, the choice of Meteor would ensure that British industry played a leading role in promoting a European missile capability, as well as securing - according to Matra BAE Dynamics - around 1,200 jobs at sites across the United Kingdom. The choice of Meteor would also enhance Eurofighter's export prospects.

Overall, the Department considered that the key consideration was the provision of effective long-term defence capability and that, despite the greater technical risks involved, Meteor should be selected. On the Raytheon bid, the Department considered that, despite being the lower priced offer, the uncertain costs and risks of relying on an upgrade to ERAAM++ (the requirement for which was not formally established in the United States) to meet the requirement in full and to provide an effective long-term missile capability for Eurofighter were not acceptable.

On 16 May 2000, the Secretary of State for Defence announced the decision to commit to development and production of the Meteor missile. The approved acquirement cost for Meteor is slightly over £1 billion, including an interim buy of AMRAAM missiles to provide a partial capability for Eurofighter until Meteor becomes available. Recognising the risks associated with Meteor, the Department is negotiating a taut contract with Matra BAE Dynamics. The intention is that the contract will contain tightly defined breakpoints requiring successful demonstration of development progress on specific technical areas. The breakpoints will be externally evaluated and, if performance is not been delivered, the partner nations will be able to terminate the contract and recover all development costs from the contractor.

30 **Recent major procurement decisions involving co-operative options**

Most decisions reflect the outcome of the COEIA analysis, although in some cases the outcome was not clear-cut

Equipment	Decision point	COEIA Clear "winner"	Yes/No	Wider factors considered Comment
Merlin Mk 1 Helicopter	1991: Completion of Development	Preferred on operational grounds	Yes	
DIRCM	1994: Full Development	Preferred on cost grounds	Yes	Consideration of benefits accruing from access to unique United States test facilities
Hercules C130J Transport Aircraft	1994: Hercules Tranche 1 Replacement	Preferred on operational grounds	Yes	Detailed consideration of political factors and quantitative consideration of industrial factors
Tomahawk Land Attack Missile	1995: Development/ Production	Preferred on cost grounds	Yes	
Common New Generation Frigate	1995: Project Definition	Preferred on cost grounds	Yes	
Future Carrier Borne Aircraft	1995: Concept Demonstration Phase	Alternative – buy United States off-the-shelf – assessed as cheaper in lifecycle terms, but with operational risks	Yes	Quantitative consideration of industrial factors
Eurofighter	1996: Production	Alternative – United States F15E – more expensive in lifecycle terms and less operationally effective	Yes	Quantitative consideration of industrial factors
Storm Shadow Conventionally Armed Stand-Off Missile	1996: Development/ Production	Alternative – German Taurus missile – closely matched in cost and performance terms	Yes	Qualitative assessment of additional industrial benefits favoured Storm Shadow option
Counter Battery Radar	1997: Production	Alternative – United States TPQ37 – cheaper in lifecycle cost terms but not available in required timescales	Yes	
TRACER	1997: Project Definition	Preferred on cost terms	Yes	
Multi-Role Armoured Vehicle	1998: Development	Alternative co-operative solution was cheaper in lifecycle terms but less operationally effective	Yes	Quantitative consideration of industrial factors
Skynet 5 Satellite	1998: Project Definition (involving national and co-operative options)	Preferred on operational grounds	Yes	Close consideration of political factors
Medium Range TRIGAT	1999: Production	Little to choose on cost-effectiveness grounds.	Yes	Close consideration of political factors. Quantitative consideration of industrial factors
Common New Generation Frigate	1999: Preparation For Demonstration phase	Decision not to proceed with co-operative programme since unable to achieve affordable cost-effective solution	Yes	Close consideration of political factors
Principal Anti-aircraft Missile	1999: Placement of Development contract	Preferred on operational grounds	Yes	
Meteor Beyond Visual Range Air to Air Missile	2000: Development/ Production	Making interim buy of AMRAAM missiles until Meteor is available preferable to risks of relying on upgrade of alternative missile to ERAAM ++ which were assessed as unacceptable	Yes	Close consideration of political and Industrial factors
A400M Future Transport Aircraft	2000: Development/ Production	Future Transport Aircraft decision was inseparable from Short Term Strategic Airlift decision.	Yes	Close consideration of international political factors. Quantitative consideration of industrial factors

Source: National Audit Office Analysis of EAC Papers

Box 2: The decision to lease C17s and subsequently to procure the A400M to meet the United Kingdom's future military transport aircraft needs

In 1994 the Department placed an order for 25 Hercules C130-J aircraft to replace part of its existing Hercules C130-K transport aircraft fleet with the intention that a second tranche of aircraft (not necessarily more C130Js) would be ordered later to replace the remainder of the C130K fleet from 2005. In 1997, the United Kingdom, together with France, Germany, Italy, Spain, Belgium and Turkey, requested proposals from the Airbus Military Company, a subsidiary of Airbus Industrie, for an aircraft to meet the agreed European Staff Requirement. In 1998, to introduce competition into the process, the United Kingdom, France, Spain and Belgium also sought proposals from Boeing and Lockheed Martin. Bids were received in January 1999 with Airbus Military proposing the new design A400M and the other two bidders proposing existing aircraft, the Boeing C-17 and Lockheed Martin C130-J

The Strategic Defence Review identified that, before entry-to-service of the chosen solution for the United Kingdom's Future Transport Aircraft requirement, there was an urgent need to improve the Short-Term Strategic Airlift capability of the Royal Air Force. Tenders to address this capability gap were invited in September 1998 with the same deadline as the co-operative Future Transport Aircraft competition. This timetable meant that the Department was able to consider the two competitions in parallel to ensure the most cost-effective overall solution was selected and that the outcome of the Short-Term Strategic Airlift competition did not prejudice the Future Transport Aircraft competition. In January 1999 five bids were submitted to meet the Short-Term Strategic Airlift requirement. None of these offered the right combination of capability and cost and the competition was terminated in August 1999. Following this decision, the Department continued to work with industry to seek an off-the-shelf solution to meet its requirement and in October 1999 new proposals were submitted by Boeing (C17), Air Foyle (Antonov An 124-100) and Heavylift (Antonov An 124-100).

The Department completed its analysis of the options in both competitions in early 2000. The Future Transport Aircraft analysis was based on a full COEIA, although the comparison of cost effectiveness was highly sensitive to assumptions about the level of risk inherent in each option. On the Short-Term Strategic Airlift competition the marked differences between the proposals meant they could not be compared on either a constant cost or constant effectiveness basis and the formal COEIA process was not applied. On the basis of the analyses it was able to undertake, the Department concluded that affordability, capability and value-for-money factors constrained the practical choice for the Short-Term Strategic Airlift requirement within the Department's existing Equipment Programme budgetary profile. Priority was therefore given, as far as possible, to meeting the full Future Transport Aircraft requirement as quickly as possible.

To inform the business case, the Department analysed in detail the international and industrial implications of committing to the A400M programme which noted that United Kingdom industry would be at the forefront of developments in the aircraft's new technology, including a new hybrid metal/carbon composite wing which would complement the existing capabilities of United Kingdom industry in this area. It was also noted that a decision in favour of A400M would assist United Kingdom industry in competing to supply the aircraft's engine. The Department, assisted by input from the Department of Trade and Industry, estimated that selection of the A400M would generate direct long-term employment for some 1,300 persons.

In accordance with normal practice in such cases, the final decision was taken by Ministers. And Ministers considered the project in the round from a United Kingdom point of view , taking account of wider national considerations of enhancing the United Kingdom's technological capacity and promoting British employment at a higher skill level. On 16 May 2000, the Secretary of State for Defence announced the decision, dependent upon securing support for the programme from other partner nations and placing a contract on acceptable commercial terms, to procure the A400M to meet the Future Transport Aircraft requirement. The Short-Term Strategic Airlift requirement was to be met by leasing four C-17s from Boeing.

Recognising the risks associated with A400M the Department, in negotiating a contract with Airbus, intends to commit industry to the unit prices that feature in its current tender response and to a programme that secures achievement of the United Kingdom's required in-service date. Purchase of C-17 will remain a fall-back option if it is not possible to negotiate, in conjunction with European national partners, satisfactory contract terms.

In announcing the decision on 16th May 2000 the Secretary of State said:
"We have now decided that our heavy-lift needs, from the latter part of this decade onwards, would be best by the A400M aircraft from Airbus Military company. This promises to be a superb aircraft - a new design that is specifically tailored to meet our military requirement. Moreover, the A400M will offer an extremely flexible capability, covering both the tactical and strategic roles. It offers scope for a multinational support package and substantial through-life cost saving.

At this point, our commitment to A400M is necessarily conditional, in that it is based on assumptions that are dependant both on our potential partners and on Airbus - on their commitments to sufficient numbers or aircraft at launch and the establishment of a viable programme.

We hope that we can sign a contract for the A400M urgently, but this must be based on realistic figures for purchase. All countries must balance the size of firm commitments against other priorities for defence equipment. The United Kingdom will order 25 aircraft in the A400M initial launch. That is sufficient to build a viable programme while safeguarding our industrial interests. We look forward to other partners following our lead, so that together we may confirm the launch order as soon as possible.

However, affordability will also rest on confirmation of unit prices at the level offered by Airbus, commitment of the in-service date that we require and satisfactory negotiation of commercial terms and conditions. Programme launch and contract placement must also by achieved within a reasonable time frame.

This will also be a smart process. We will hold European industry to its promises. If Airbus cannot offer us and our partners an affordable and manageable programme on that basis, we will be able to meet our military requirement and protect taxpayers' interests by purchasing a fleet of Boeing C-17 aircraft as an alternative. However, we look forward to success in this exciting and innovative programme.

A400M will offer great benefits for the United Kingdom. BAE Systems expects the programme to create directly 3,400 long term high-skill, high-wage jobs - in particular at its sites at Filton, Broughton and Prestwick - with indirect employment taking the figure to more than 10,000.

Our industry will be at the forefront of developments in the aircraft's new technology, including a carbon composite and metallic hybrid wing and a new propulsion system. The project will strengthen the European aerospace industry, and will complement the world-leading wing capabilities of British industry, which we are supporting through the major investment that we have recently announced for the development of the A3XX.

A vital and technologically innovative element of the A400M will be its engines. Airbus Military, as prime contractor, will be responsible for selecting the best power plant so that the aircraft will meet its commitments to the partner nations on performance and price. However, we will make sure that, in its decision, Airbus Military takes full account of the merits of the likely proposal from Rolls-Royce and the undeniable quality of it products.

These procurement decisions are of great importance for our armed forces and for our defence capability for several decades to come. They deliver on our promises in the Strategic Defence Review. They make a significant contribution to Europe's defence capabilities and they are good news for British industry and for British jobs. I commend them to the House.

- On six programmes the results of the COEIA were finely balanced. The BVRAAM programme, described in **Box 1**, provides a good example of such a decision;
- In three cases - Storm Shadow, Medium Range TRIGAT and A400M - wider factors, as well as the outcomes of the COEIA, were central in the decision-making process. In the case of Storm Shadow, the competing Taurus option was closely matched in cost and performance terms, but the wider industrial benefits resulting from the potential merger of the missile interests of British Aerospace and the French company Matra were contingent on the selection of Storm Shadow. The A400M example is described in **Box 2** and the MR TRIGAT example examined in detail in our Reports on the Major Projects Report 1999 (HC613 Session 1999-2000) and the Major Projects Report 2000 (HC970 Session 1999-2000);
- Eleven of the seventeen decisions were taken collectively by Ministers.

(b) How other nations decide to commit to co-operative programmes

4.9 Given the importance of decision-making by partners in progressing co-operative programmes, we also considered how France, Germany, Italy and the United States reach decisions on whether to commit to co-operative programmes. Our analysis highlights a number of differences compared to the United Kingdom model. Most notable are the extended role of the legislature and, as far as our European partners are concerned, the different emphasis placed on the wider benefits of co-operation.

Our major European partners place greater emphasis on securing wider benefits through equipment co-operation

4.10 While the United Kingdom does take industrial and political considerations into account, our major European partners tend to place greater emphasis on the importance of protecting national industrial interests and enhancing European political co-operation through co-operative acquisition. French, German and Italian officials outlined to us the belief that defence equipment co-operation had a crucial role to play in the development of a Common Foreign and Security Policy and European Security and Defence Identity. When asked to cite examples of successful co-operative programmes, officials appointed to "champion" co-operation in the Italian and German Ministries of Defence referred to the Tornado aircraft, and French officials referred to the Franco-German helicopter. In both cases, their criteria for success were the national industrial benefits which had resulted from the co-operative programmes.

4.11 The perspectives of our major European partners on co-operation are also reflected in their equipment decision-making processes. In France, the Armaments Directorate (Délégation Générale pour l'Armement) includes both operational divisions responsible for industrial, international and financial strategy issues. The functional divisions act as the interface between French industry and the military, and the resulting equipment programme is sponsored by the joint Chief of Staff for onwards submission to Ministers, Cabinet and Parliament. In Germany and Italy, all commitments worth more than approximately £17 million require Parliamentary approval. In Italy, there is an inter-departmental committee chaired by the Italian Ministry of Defence and including representation from the Trade, Industry, Finance and Foreign Affairs departments which meet monthly to discuss the Italian equipment programme. The objective of the committee is to ensure that the interests of all appropriate government departments are taken into account prior to submission of the acquisition recommendation to Parliament.

United States decisions result from an extended lobbying process

4.12 The United States system revolves around an extended Congressional lobbying process, which ensures that both very narrowly focussed factors and wider industrial and foreign policy issues are taken into account, although in a different way to the various European models. A key feature of the United States model is that commitment to, and funding for, co-operative programmes must be supported by annual approvals from Congressional Budget and Authorising Committees. This means that, in practice, participation in co-operative programmes is only secured if there is strong commitment from the Services or - exceptionally - through Congressional lobbying and that Military, industrial and political factors must be balanced, and approval secured, throughout an extended planning, programming and budget process (ie such programmes may be vulnerable to cancellation).

4.13 The United States system means that co-operation may be viewed by programme sponsors as a way of supporting a programme at the margins of the United States equipment plan. In such cases, partners may be able to secure significant benefits. For example, on the WR21 marine turbine project, the Department has contributed £66 million to a £300 million United States development programme: the project would have been unaffordable for the United Kingdom to have undertaken alone. Despite the United Kingdom's smaller financial commitment, the Department could be the first operational user of the engines in the Type 45 destroyer. The United Kingdom and French participation in the programmes has been a major factor in securing Congressional backing in the United States for its completion to the end of development, and in mandating the engine as a candidate for future United States destroyer requirements. Sometimes, however, co-operative programmes may drift with insufficient United States funding to commit to new phases, as on the United States/German/Italian MEADS air defence programme.

4.14 The size of the United States defence budget in relation to much smaller European budgets also means that the United States perspective on co-operation can be different to those of its major European partners and they may fund alternative national programmes. This was the case with the co-operative MLRS TGW programme from which the United States withdrew in favour of the national Brilliant Anti-Armour Technology programme. These different perspectives are also reflected in the organisational structure of the United States Department of Defense. For instance, the responsibilities of the Principal Director for Armaments within the United States Department of Defense cover both co-operative acquisition programmes and the sale of United States-developed military equipment overseas.

4.15 There are signs, however, that budgetary pressures within the United States, together with an increased emphasis on the need to ensure inter-operability, seem to be leading to a fuller recognition of the benefits of equipment co-operation, both between the individual United States Armed Services and with other nations. For example, the cost-effectiveness of proposals submitted by single Services are now validated and approved by a Joint Requirements Oversight Council. This Council, increasingly supported by Congress, may mandate co-operative or inter-Service programmes on cost-effectiveness grounds in approving funds. In addition, the Department of Defense has announced that it now considers inter-operability with the equipment of other United States Services and allies a "key performance parameter" in the development of individual weapons systems.

Appendix A

Co-operative programmes involving the United Kingdom at the time of our Census in January 1999

In Service	Nature of the Collaboration	Participating Services	In-Year support cost (£M)[1]
Sea systems			
Harpoon Surface to Surface guided missile	Joint trials, in-service support	United States	1.95
NATO Sea Gnat (Surface Ships DECOY Rocket Launch System)	Development and production	Denmark, United States	0
Goalkeeper	In-service support	The Netherlands	0
Tube Launched Optically Tracked Wire Guided Missile System	In service support arrangement	Canada, Denmark, Germany, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Turkey	0.14
Tomahawk Land Attack Missile	Foreign Military Sales Agreement, in-service support	United States	40.10[2] 3.12
Trident II DS Strategic weapon system (submarine launched ballistic missile system)	Co-operative sales agreement, in-service support	United States	106.00 50.00
StingRay Mod 0	Exchange of technical data, joint trials, in-service support	Norway	0
Spey SMTA gas turbine (marine gas turbine propulsion plant for major warships)	In-service support	The Netherlands	0.17
Olympus/Tyne gas turbine (marine gas turbine propulsion plant for major warships)	In-service support	The Netherlands, France, Belgium	2.10
Garbage Processing Machine and Bilge Water Separator	Exchange of maritime environmental protection equipment	The Netherlands	0
Land systems			
M3 Amphibious Bridging	Development and production	Germany	10.4[3]
FH70 field howitzer	In-service support	Germany, Italy, Holland	0
CVR(T) Scorpion Armoured Reconnaissance Vehicle	In-service support	Belgium	0
Multiple Launch Rocket System Phase 1[4]	In-service support	Germany, France, Italy	3.4
Multiple Launch Rocket System Phase 2	Production	Germany	0
Milan Infra Red Attachment (MIRA)	In-service support	Germany, France	0

1 In-year support costs incurred on a co-operative basis at 1998/99 prices.
2 In-year acquisition costs for Tomahawk Land Attack Missile and Trident.
3 In-year acquisition cost for M3 amphibious bridging.
4 The Multiple Launch Rocket System Phase 3 programme covered by the extant Multiple Launch Rocket Systems Memorandum of Understanding involving France, Germany and the United States was cancelled during development.

In Service	Nature of the Collaboration	Participating Services	In-Year support cost (£M)
Air systems			
Tornado multi role combat aircraft	In-service support	Germany, Italy	153.1
Jaguar aircraft	Jaguar Airframe and Engine spares provisioning and re-supply	France	0
Harrier GR7 and T10	In-service support	United States	0
Hawk training aircraft	In-service support	Finland	1.02
Allison T56 aeroengine for the Hercules C130K	International engine management programme for the Allison T56	28 member states including United States and European Union member states	1.00
RB 199 Aeroengine	In-service support of the Tornado Weapon system	Germany, Italy	122.4
27mm Mauser Gun (Tornado aircraft cannon)	In-service support of the Tornado Weapon system	Germany, Italy	0.63
Sidewinder AIM 9L	In-service support	Germany, Italy, Norway, Sweden, Portugal, Netherlands, Denmark, Spain	0.29
Sea Skua Air Launched Anti-Ship missile	In-service support and trials	Germany	0
Pegasus II Aeroengine for Harrier GR7 Aircraft	In-service support	United States	3.93
Gazelle AH1, HT3 (Light Observation Helicopter)	Purchase agreement, modifications	France	0
Puma HC Mk 1 (support helicopter)	Purchase agreement, modifications	France	0
Lynx WG13 Helicopter	Purchase agreement, in-service support	France	0
United Kingdom Air Defence Ground Equipment (UKADGE)	Purchase agreement, In-service support	Denmark	0
Communications			
Joint Tactical Information Distribution System (JTIDS)	Joint Trials, Purchase Agreement and In-service support	United States	0

In production	Nature of the collaboration	Participating nations	United Kingdom Acquisition cost (£m)[5]	In-year acquisition cost (£m)
Land systems				
Counter Battery Radar (COBRA)	Development and production	France, Germany	177.8	16.3
Air systems				
Eurofighter	Development and production	Germany, Italy, Spain	14129	524
Merlin HM Mk1 Helicopter	Development	Italy	1579[6]	11.9
Directional Infra Red Countermeasures (DIRCM)	Development	United States	167.3	26.91
Communications				
Global Positioning System	Purchase agreement - Signatory nations have access to Precise Positioning Service which provides improved accuracy and security necessary for coalition and military operations	NATO nations	N/A	N/A

Project Definition or Full Development	Nature of the collaboration	Participating nations	United Kingdom Acquisition cost (£m)	In-year Acquisition cost (£m)
Sea systems				
HORIZON (Common New Generation Frigate programme)	Development	France, Italy	112.5	15.96
Principle Anti-Air Missile System (PAAMS) (Common New Generation Frigate programme)	Development	France, Italy	57.2	1.71
WR21 Propulsion Gas Turbine for Naval Ships	Development	United States	65.5	2.80
Surface Ship Torpedo Defence	Development	United States	33.0	4.56
Co-operative Outboard Logistics Update (COBLU) (Surface Ship Communications Electronic Support Measures)	Development	United States	77.7	4.45
Sting Ray Life Extension	Information Exchange, Trials	Norway	N/A	N/A
Land systems				
Medium Range TRIGAT	Development	France, Germany, The Netherlands, Belgium	124	4
Long Range TRIGAT	Development (United Kingdom will not proceed to production)	France, Germany	267	3.00
Multi Role Armoured Vehicle (MRAV)	Development	France, Germany	71.7	1.20
Aimed Controlled Effect Anti-Tank Mine (ACEATM)	Development	France, Germany	12.1	0.25
Guided Multiple Launch Rocket System (GMLRS)	Development	United States, Germany, France, Italy	14.3	2.42

5 Estimated acquisition expenditure for approved phases only at 1998/99 prices.
6 Co-operative development costs on Merlin Mk 1 only.

Project definition or full development	Nature of the collaboration	Participating nations	United Kingdom Acquisition cost (£m)	In-year acquisition cost (£m)
Air systems				
Conventionally Armed Stand Off Missile - Storm Shadow	Development and production	France	878	72
Apache Attack Helicopter	Exchange of information between United Kingdom and Dutch acquisition programmes	The Netherlands	N/A	N/A
Starstreak (air to air missile for Apache Attack helicopter)	Provision of missiles for United States trials in return for full access to results	United States	N/A	N/A
Communications				
Universal Modem System	Development	United States	20.4	4.28

Feasibility Study or earlier stages	Nature of the collaboration	Participating nations	United Kingdom Acquisition cost	In-year acquisition cost (£m)
Sea systems				
NATO Improved Link 11 (NILE)	Feasibility study	United States, Canada, Italy, Netherlands, France,Germany	5.92	0.75
NATO Submarine Rescue System (NSRS)	Feasibility study	France, Italy, Norway, United States	0.53	0.06
Instrumented Trimaran Demonstrator Trials	Technology Demonstrator Trials	United States	6.6	0.07
Land systems				
Very Short Range Air Defence Systems	Feasibility study	France, Germany, Italy, Netherlands, Norway, Turkey, United States	5.82	2.02
Tactical Reconnaissance Armoured Combat Equipment Requirement (TRACER)	Project Definition	United States	124	11.98
Lightweight Mobile Artillery Weapons System (LIMAWS)	Development	United States	5.351	3.32
Air systems				
Future Offensive Air System	Technology Demonstrator Programme	France	31.5	4.10
Joint Strike Fighter aircraft	Concept Demonstrator Programme	United States	121	33.00
Airborne Multimode Solid state Active Array Radar	Technology Demonstration Programme	France, Germany	45.05	0.05
Future Transport Aircraft	Development	France, Germany, Spain, Italy, Belgium, Turkey	0.513	0.32
Joint Airborne Navigation and Attack (JOANNA)	Technology Demonstrator Programme	France	12.05	0
Communications				
TACOMS-Post 2000	Development of Standardisation . agreements specifying tactical communications system - Post 2000	Belgium, Canada, France, Germany, Italy, The Netherlands, Norway, Portugal, Spain, Turkey, United States	2.352	0.33
Inter-operable Network for Secure Communications (INSC)	Technology Demonstrator Programme	France, United States, Canada, Netherlands, Germany, Norway	0	0

Appendix B Study methodology

The main features of our methodology are summarised in **Figure 8** on page 12. **Figure 9** on page 13 shows how the methodologies provided evidence to support the two study issues. This Appendix provides more detailed information about each of the exercises which we undertook and explains how the data obtained was used to examine the issues and draw conclusions.

1. Census of Co-operative Projects

We undertook a census of all co-operative projects underpinned by a Government-to-Government agreement to build up a comprehensive picture of United Kingdom defence equipment co-operation throughout the equipment lifecycle. The census took the form of a postal questionnaire sent to project managers in the Defence Procurement Agency and the Defence Logistics Organisation. The census was completed in early 1999 and provided project specific data on the following:

- Co-operative partners;
- In-year (1998-99) and approved expenditure;
- Cost variance and programme slippage;
- National variants;
- Cost share and work share arrangements;
- Management and decision-making arrangements;
- Industrial arrangements;
- Co-operative support arrangements; and
- The achievement of the wider political, military and industrial benefits of defence equipment co-operation.

The survey identified 64 co-operative equipment projects which are listed in Appendix A. The data was analysed using SNAP 4+ Professional Version software for questionnaire design and analysis.

2. Case Studies

We selected a judgmental sample of eight case studies covering a range of military environments, co-operative partner nations and lifecycle stages. Our investigations were based around a structured programme of interviews and file review at United Kingdom project offices. In addition to providing further detail on the topics covered by the census, the case studies provided information on:

- the rationale for co-operation rather than pursuing alternative national or co-operative options;
- the extent of design commonality; and
- the merits of different management or industrial structures.

Figure 31 opposite provides further details of the case studies. The principle focus of our examinations were on the Common New Generation Frigate (CNGF), Joint Strike Fighter (JSF) and Multiple Launch Rocket System (MLRS) programmes. Further details of these programmes are provided in Appendix C.

3. Overseas Military Comparators

Structured interviews were held at the French, German, Italian and United States defence ministries and Defence Attachés/Defence Supply staff at the British Embassies in these countries. The aim of these discussions was to gain a balanced understanding of other nations' perspectives of equipment co-operation and the factors which influenced other nations' decisions to co-operate.

4. Historic experience

We commissioned HVR Consulting Services to review the economics of defence equipment co-operation. They considered whether co-operative development and production was more or less expensive than that undertaken nationally and the effect of co-operation on development and production timescales. Their analysis was underpinned by detailed case studies of past co-operative projects including Tornado GR1, MBT-80, Puma helicopter and MR TRIGAT with the aim of identifying crucial early decisions with regard to cost and performance and establishing the extent to which these requirements were met by decisions taken.

5. The views of key stakeholders within Government

We held structured discussions with key Departmental officials (up to and including the Chief of Defence Procurement) and met with officials from the Department of Trade and Industry, the Treasury, the Foreign and Commonwealth Office, the Cabinet Office and Organisme Conjoint de Cooperation en matiere d'ARmement (OCCAR). The aim of such discussions was to identify the contributing factors and the mechanisms by which decisions to enter co-operation with partner nations are taken.

6. EAC submission and COEIA review

Equipment Approvals Committee (EAC) submissions and Combined Operational Effectiveness and Investment Appraisals (COEIAs) documents were examined for the Department's 16 most recent major acquisition decisions involving a co-operative aspect. In particular we analysed:

- The acquisition stage at which the decision to co-operate was made;
- Whether or not the winner of the COEIA was selected;
- Any wider industrial and political factors considered; and
- The extent to which wider industrial and political factors were quantified.

7. Requirements Capture

To examine the extent and quality of information available to allow the Department to identify opportunities to co-operate with other nations, we undertook computerised interrogations of:

- the Equipment Requirement Schedule held by the Western European Armaments Group (WEAG) Panel 1; and
- the Conventional Armaments Review Document held by NATO.

as they stood at 30 September 1998. The statistical analysis was supported by interviews with United Kingdom and European representatives of WEAG and United Kingdom and United States representatives of NATO.

31 **The case study equipments covered by the Report**

Project	Environment			Lifecycle Stage		Partner nations (in addition to United Kingdom)
	Sea	Land	Air	Acquisition	In-service	
Joint Strike Fighter Aircraft			✓	✓		United States
Common New Generation Frigate	✓			✓		France, Italy
Multiple Launch Rocket System		✓		(✓)	✓	United States, France, Germany
TRIGAT anti-tank missile Belgium		✓		✓		France, Germany, Netherlands,
PUMA helicopter			✓		✓	France
Directional InfraRed Counter-Measures			✓	✓		United States
Gas Turbines	✓				✓	France, Netherlands, Belgium
WR21 marine engine	✓			✓		United States

Source: National Audit Office

8. Co-operative Research

We commissioned the Defence Engineering Group, Department of Mechanical Engineering, University College London to review all defence-related research in which the United Kingdom co-operates with partner governments. Their report identified the different types of defence research co-operation and the potential benefits and drawbacks of each. They also assessed the track record of United Kingdom international defence research co-operation and determined the scope for the Department to increase the benefits. They have achieved these objectives by:

- interviewing experts and stakeholders from the Department, DERA and industry;
- analysing databases held by the Department's Directorate of Research (International Co-operation); and
- undertaking a literature survey of the field of technological co-operation.

9. Industry perspectives

We held two expert seminars. The first helped develop the study issues and the second was used as a sounding board for our initial findings and conclusions. The seminars were attended by experts from the defence industry and defence trade organisations, experts from academia and representatives from the Department.

Separately, we also conducted structured interviews with representatives from the Defence Manufacturers Association and the Society for British Aerospace Companies.

Appendix C The case studies

Case study 1: The Common New Generation Frigate (CNGF)

Participating nations:	United Kingdom, France, Italy
Date the collaboration started:	Trilateral Staff Requirement, 1992; Horizon Programme Memorandum of Understanding 1994; PAAMS Programme Memorandum of Understanding 1996
Cost:	Total acquirement costs were estimated at around £16 billion of which £6 billion would have been borne by United Kingdom
Originally estimated In-service date:	December 2002
Currently estimated In-service date (for the Type 45 Destroyer):	November 2007
Current Lifecycle stage:	Project Horizon: United Kingdom pursuing national programme. PAAMS: Full scale co-operative Engineering Development/Initial Production

Project History

1. The CNGF was intended to provide a replacement for the United Kingdom's Type 42 Destroyers following the collapse of the earlier co-operative NATO Frigate Replacement for the 1990's (NFR 90) programme. A Trilateral Staff Requirement was signed by the United Kingdom, France and Italy in 1992 and amended in 1994 to subsume the PAAMS requirement. The CNGF programme comprised two distinct elements, the Principle Anti-Air Missile System (PAAMS) and the warship programme (Project Horizon). Whilst the linkages between the two programmes were recognised by interface documents, in practice PAAMS was to have been supplied to the Project Horizon programme as Government Furnished Equipment and each was managed as separate co-operative programme with their own government and industrial management arrangements. It was only within the Department that the two programmes were managed as a coherent whole.

2. The programme has been affected by delays. In particular, differences between the United Kingdom and other partner nations concerning the extent to which different systems would meet the requirement, have led to a total of 37 months slippage. Because of the need to align the PAAMS programme with that of the warship, this delay translated to slippage on Project Horizon. By October 1998, the dispute over the PAAMS requirements had been resolved and nations were ready to place a contract with industry for the Full Scale Engineering and Development/Initial Production (FSED/IP) phase. However, by this time problems had emerged on the warship programme, and in April 1999 nations decided not to proceed to the next stage of the programme. The Department is now procuring the warship on a national basis to an in-service date of November 2007. The Department remains committed to the co-operative PAAMS programme and is confident of meeting the in-service date of November 2007 set for the Type 45, whilst acknowledging that the programme is challenging.

Co-operative Approach

3. The CNGF programme was based on a detailed Trilateral Requirement with the intention being to design and build identical First-of-Class ships for each of the partner countries with as few variants as possible. However, despite a concerted effort to achieve a high level of design commonality, differing underlying national requirements and interpretations of the Trilateral Requirement have caused much of the difficulty on both the Horizon and the PAAMS programmes.

4. On **PAAMS**, France and Italy selected the EMPAR Multi-Function Radar being developed by the Eurosam consortium (comprised of Thomson-CSF, Aerospatiale and Alenia) as part of the separate Franco-Italian FSAF (Famille de Systèmes Anti-aériens Futurs) programme. The United Kingdom selected the alternative nationally developed SAMPSON radar, arguing that EMPAR did not meet the performance specified in the Trilateral Requirement. In order to manage the differing national Multi-Function Radar requirements nations have, after much debate, agreed to a twin-track approach, giving the Department greater freedom in the design of the United Kingdom variant. Under this approach Eurosam will be responsible for integrating the Franco-Italian variant and UKAMS (a wholly owned subsidiary of Matra-BAe Dynamics) will be responsible for the United Kingdom requirement.

5. On **Project HORIZON**, the International Joint Venture Company (IJVC) was created from three companies nominated by the participating nations: GEC-Marconi (United Kingdom - selected following a national competition), DCN International (France) and Orizzonte (Italy). As the Design and Validation phase of Project Horizon progressed, serious concerns emerged about the future of the programme. In particular that:

   - the IJVC was unable to put forward proposals for an affordable ship that would deliver the capability and in-service date specified in the Trilateral Requirement;
   - the IJVC had not established itself as a strong prime contractor with a robust supporting industrial structure. The lack of clear leadership meant there was a risk that the shareholder companies were more concerned with their own work share rather than managing the programme on an objective basis.

6. Following prolonged but ultimately futile attempts to overcome these concerns the partner nations and industry concluded in April 1999 that the programme should not progress to the next phase. Overall, the absence of an industrially robust - as distinct from a specially formed - prime contractor encompassing responsibility for the platform and the weapons fit spelled the end of what had looked at least like a very promising project. France and Italy have subsequently begun a separate bilateral programme whilst the United Kingdom is pursuing the national Type 45 Destroyer programme.

Financial Impacts

7. The need to co-operate on PAAMS, and that system's need to interface with the ship led to the possibility of shared costs on the ship. Indicatively, when the Department committed to the Design and Validation phase in 1995, it estimated that co-operation could save up to £250 million compared to a national programme. Savings through co-operation will not be realised on the national Type 45 Destroyer programme, although the Department do expect to secure some savings by employing Smart Acquisition techniques. For example, incremental acquisition techniques have avoided the need for substantial early development expenditure on ships' systems. This means that the unit production cost of the national warship is expected to be 8 per cent less than the Horizon warship because of reductions in the capability required when it enters service.

8. The ASTER missile being developed under the separate Franco-Italian FSAF programme is a key building block for the PAAMS system. The United Kingdom withdrew from the predecessor of the FSAF programme in 1993 because of uncertainty over its long term plans. It is subsequently paying sunk costs of £160 million to contribute to the development of those items in the FSAF programme that are now common to both FSAF and PAAMS, and to secure the appropriate Intellectual Property Rights for the United Kingdom.

Wider Impacts

9. In taking forward the Type 45 Destroyer programme the Department plan to make the fullest possible use of the results of the outcome of the Project Horizon programme to which they had committed some £100 million. However nearly all of the 5 year slippage on the programme is attributable to co-operative problems some of them on the PAAMS programme which was the raison d'etre for the ship. The main operational effect of the slippage is that the Department will be required to run on the Type 42 Destroyers carrying the Sea Dart missile system for longer. Although a number of modifications have been made to Sea Dart, including a fuse upgrade which is forecast to come into service eight years late in mid-2001, the Department has assessed that the Anti-Air Warfare capability will remain limited against emerging 21st century threats such as modern sea-skimming missiles. In addition, the Department will also incur higher support and operation costs through running on the ageing equipment although it will have delayed acquisition expenditure on PAAMS and the Type 45 Destroyer.

10. Looking more widely, the collapse of Project Horizon gave out negative signals concerning the European commitment to co-operative defence acquisition, in particular the harmonisation of military requirements within Europe. This perspective has been partially countered by the decision to continue co-operation on the PAAMS programme, where, whilst nations will have different multi-function radars, the majority of the sub-systems, in particular the ASTER missile, will be common. This will confer inter-operability benefits between the three partner nations.

Case study 2: MLRS: Multiple Launch Rocket System

Participating nations:	United Kingdom, United States, France, Germany, Italy.
Date the collaboration started:	"Basic" MOU, launching Phases I and II, signed 1979. Supplement launching Phase III signed 1983. Supplement launching next generation MLRS ("Guided MLRS", or "GMLRS") signed 1998.
Cost of the equipment:	MLRS I: European development contribution and Europroduction costs estimated at around £2.5 billion, of which £700 million borne by United Kingdom. MLRS II: European development contribution and Europroduction costs estimated at around £440 million, of which £120 million borne by United Kingdom. MLRS III: Total procurement costs estimated at around £4 billion, of which £815 million would have been borne by United Kingdom. Actual United Kingdom expenditure £19 million GMLRS: Total procurement costs estimated at £2.75 billion. Development costs estimated at £120 million, of which £15 million will be borne by United Kingdom.
Originally estimated ISD:	MLRS I: July 1986. MLRS II: December 1990. MLRS III: December 1993.GMLRS: December 2010.
Achieved/currently estimated ISD:	MLRS I: December 1990. MLRS II: December 1995. GMLRS: December 2010.
Current Lifecycle stage:	MLRS I and II currently in service. MLRS III programme collapsed 1993. GMLRS in Engineering and Manufacturing Development phase.

Project History

1. Germany, Italy and the United Kingdom had co-operated in the 1960s on a project to develop a multi-barrelled rocket launcher. Although, at a technical level, the project was successful it was cancelled in 1974 when it forecast logistic support costs were too high. Subsequently, the European nations expressed interest in the Multiple Launch Rocket System being developed in the 1970s by the United States. In 1979, Germany, France, United States and United Kingdom signed the MLRS "Basic" Memorandum Of Understanding (MOU), whereby the European nations contributed to funding the United States-led development of the launcher and the basic rockets ("MLRS Phase I") in exchange for partner status on the programme. Similarly, the United States, United Kingdom and France contributed to funding the German-led development of specialised rockets containing the AT2 anti-tank mine ("MLRS Phase II"). Italy joined the programme in 1982.

2. The “Basic” MOU gave the European participants full production rights for both the launchers and rockets, and in 1985 the United Kingdom, France, Italy and Germany signed an MOU setting out a framework for European co-production. Protracted negotiations over work share and affordability delayed the commencement of European production deliveries until 1989, over four years after United States deliveries had begun.

3. Meanwhile, in 1983, Germany, France, United States and United Kingdom agreed to co-operate in the development of a terminally-guided MLRS rocket capable of destroying latest-generation Soviet tanks ("MLRS Phase III"). Although a terminally-guided rocket was made to work, the United States subsequently decided in favour of an alternative programme for meeting their requirement which they had been funding as a parallel "black" (secret) project. The United States withdrew from MLRS Phase III in 1992. Germany also withdrew that year because of budgetary constraints. The United Kingdom withdrew in 1993, and France in 1994.

4. National partners are now co-operating in upgrades to extend MLRS capability into the new century. The most significant of these is the replacement of the original MLRS Phase I rocket with a longer-range, guided rocket ("GMLRS"). An MOU governing GMLRS development was signed by Germany, France, Italy, United Kingdom and United States in 1998.

Co-operative Approach

5. Co-operative arrangements have evolved as the programme has matured. European co-production of MLRS Phases I and II depended on setting up manufacturing facilities - for Phase I, parallel to those already existing in the United States - across four participating nations' industries. This process suffered from rigidities in the need to match national work shares to nations' planned off-take numbers, and additionally to secure each nation's industry a balanced technical work content. Additionally, governments' insistence that their nation's industries be involved in particular manufacturing processes led to an element of dual-sourcing: for example, the establishment of a second, British-based bomblet manufacturing facility which the United Kingdom was required to fund unilaterally.

6. There were also difficulties in governmental management arrangements for European co-production. Initially, Germany acted as Pilot Nation and managed the programme through its own procurement staff. This was found to be unsatisfactory, leading to the establishment, in 1990, of a dedicated European MLRS Project Office. However, since the Project Office lacked legal status, Germany retained responsibility for placing contracts and for handling public funds.

7. Co-operative arrangements for MLRS Phase III development showed some improvements over those for the earlier phases, although several weaknesses remained. The United States acted as Pilot Nation and established a Project Management Office within its Missile Command. This was staffed by officials from each of the four participating nations but led by a United States manager who was also manager for United States national MLRS activity. On the industrial side, the international prime contractor consortium suffered initially from weak management and poor financial incentivisation. It was later strengthened by the introduction of maximum price ceilings and milestone payments.

8. The GMLRS development programme currently underway shows some similarities with the MLRS Phase III development programme on the government side, with the United States again acting as host nation and the Project Management Office sited in United States Aviation and Missile Command. However, the intention is that the United States and Europe should have equal stakes in the management arrangements and negotiate as partners of equal weight. To this end, four-nation inter-European management structures have been established to parallel the five-nation overarching management structures that include the United States.

9. On the industrial side, the United States company Lockheed Martin Missiles and Fire Control has been appointed prime contractor for GMLRS, but international competition is being used to select subcontractors for parts of the development programme. The main challenge will arise on the production phase, where industrial arrangements must be established on a global basis if partner nations are to avoid the costly duplication that characterised production of MLRS Phase I. Though all co-operative partners accept the principle of globalisation, there is uncertainty as to whether it should be established through international competition, or involve a degree of planning. The lead European partner companies for the development phase (with the exception of United Kingdom industry) are already positioning themselves for negotiations on production by forming themselves into a consortium.

10. Co-operative arrangements have also been established for In-service support of partner nations' MLRS inventories. A single configuration control system, run from the United States, has ensured that there is some 95 per cent commonality between partner nations' MLRS systems. Additionally, for partner nations' assets based in Europe (including those of the United States Army), a dedicated agency under NATO auspices manages a co-operative spares acquisition and repair function.

Financial Impacts

11. The costs of transferring technology from the United States to establish European co-production of MLRS Phase I have been estimated at £190 million, of which some £50 million was incurred by the United Kingdom. In terms of Unit Production Costs, European sourcing of the United Kingdom's requirement was estimated in 1985 as only marginally (1 per cent) more expensive than the alternative of direct purchase from the United States. Significantly, however, the United States have achieved third-party sales of MLRS Phase I to 9 overseas customers: the Europeans have achieved none. The explanation lies partly in that United States production facilities were able to supply third-party orders while European facilities were fully occupied meeting partner nations' requirements. But it is also likely that, where third parties were able to acquire from either source, United States-supplied equipment was more competitive on price. Under the terms of the "Basic" MOU, third party sales by European nations were to have attracted a levy to offset the Europeans' liabilities to the United States for MLRS Phase I development.

12. The cost-effectiveness of co-operation on GMLRS will only be fully apparent in the production phase, since this accounts for 96 per cent of acquisition costs. Indicatively, however, Combined Operational Effectiveness and Investment Appraisal (COEIA) analysis suggests that the United Kingdom could afford 54 per cent more identical rockets if it co-operated with its three European partners, and 90 per cent more identical rockets if co-operation was further extended to include the United States.

Wider Impacts

13. Through their participation in the MLRS programme, the European governments have secured for their industries the technology needed at least to keep up with United States-led developments. For MLRS Phase I, this undoubtedly involved a cost premium over the alternative option of direct purchase from the United States, and would not have been undertaken had there not been high-level political and industrial consideration of wider co-operative factors. One such factor is downstream acquisition programmes: for instance, the "Basic" MOU noted in respect of the then future MLRS Phase III that "follow-on developments will lend themselves to co-operative efforts of a broader multinational nature than are possible in the first two Phases of the programme".

14. United States Department of Defense officials told us that, although there were still practical difficulties in working with their European partners, they regarded MLRS as one of the most successful examples of a co-operative equipment programme. While the United States still tends to lead in ongoing MLRS development, the Europeans have now established themselves collectively as a partner of equal status. European technology has contributed significantly to defining the technical specification of GMLRS, and may help to drive down the costs of an Improved MLRS Fire Control System.

15. A further set of benefits flow from inter-operability - the fact that different partner nations operate essentially the same equipment. This has assisted not only co-operative equipment support (see paragraph 10), but has also promoted standardisation in the development of successor equipments and facilitated a common approach to training and operational effectiveness. There is thus for MLRS a recognised "User Community", formalised through a Joint Steering Committee that was originally established solely for acquisition issues. The Steering Committee brings together acquisition, requirement and logistics staff from both the United States and the European bloc. Third party users are not formally represented, but tend to let the United States speak on their behalf.

Case Study 3: JSF: Joint Strike Fighter

Participating nations:	United States, United Kingdom (Full Partners). Denmark, Netherlands, Norway (Associate Partners)
Date the collaboration started:	Joint United States/United Kingdom Concept Studies 1986. United Kingdom joins United States-led risk-reduction programme 1994. United States/United Kingdom sign MOU for Concept Demonstration Phase 1995
Cost of the equipment:	Total acquisition costs have been estimated at around $220 billion. Target Cost for Current Concept Demonstration Phase is $2 billion, of which $200 million (£125 million) will be borne by United Kingdom
Originally estimated ISD:	December 2012 (for United Kingdom requirement)
Currently estimated ISD:	December 2012 (for United Kingdom requirement)
Current Lifecycle stage:	Concept Demonstration (equivalent to United Kingdom Assessment Phase)

Project History

1. In addition to the obvious imperative of the unaffordability of developing a separate national solution, United Kingdom participation in the Joint Strike Fighter programme has built on longstanding United Kingdom-United States co-operation in vectored thrust technology. This co-operation dates back to the late 1950s when the British company Hawker Siddeley were looking to maximise the potential of their prototype Pegasus aeroengine. This led to United Kingdom/United States co-operation on the supersonic AV-16A programme and on development and production of the subsonic AV-8A (the United Kingdom version of the AV-8A, the Harrier, entered service in 1969). In 1986, the United Kingdom and United States embarked on joint studies to optimise Advanced Short Take-Off and Vertical Landing (ASTOVL) technology, with a view to ultimately procuring successors for the RAF Harrier, the Royal Navy Sea Harrier and the United States Marine Corps AV-8B. These studies subsequently evolved into a United States-initiated risk-reduction programme, which the United Kingdom joined retrospectively in 1994.

2. United Kingdom involvement in the programme has been complicated by the fact that, since 1993, the United States has been seeking to bring together the AV-8B replacement programme with programmes to replace the United States Air Force F-16 and the United States Navy A-6. Despite the differences between these aircraft and the missions they are intended to fulfil, proponents of the common programme (since 1996 known as the "Joint Strike Fighter") argue that substantial through-life savings will be achieved through 80 per cent of components being common to all three aircraft types. In 1995, the United States Congress directed, without prior consultation with the United Kingdom, that the ASTOVL risk-reduction programme should be subsumed within the Joint Strike Fighter programme, on the grounds that this offered the best prospect of procuring an affordable aircraft for all three United States Armed Services.

Co-operative Approach

3. The United Kingdom has secured full partner status on the Concept Demonstration Phase of the JSF programme, despite the fact that its requirement is limited to up to 150 aircraft, compared with some 3,000 aircraft required by the United States Armed Services. The Memorandum of Understanding governing the Concept Demonstration Phase of the programme allows the United Kingdom full rights to the "Core" elements of the programme (ie those systems and sub-systems common to all three aircraft variants), plus the ASTOVL-specific elements.

4. The Concept Demonstration Phase is being progressed by two competing United States-led industrial airframe groups, Boeing and Lockheed Martin. Each group will develop and test two concept demonstration aircraft, which will be used to prove critical system characteristics for each variant. There are no formal arrangements for distributing work between United Kingdom and United States industry. However, the two governments are working to facilitate an environment in which industry from both nations can compete to secure work share based on best value, rather than prescribed quotas.

5. JSF aims "to be the model acquisition programme for Joint Service and International Co-operation". The United States-based programme office, in which United Kingdom appointees act both as JSF programme officers and national acquisition staff, have promoted a pioneering approach to equipment acquisition. In particular:

   - "Cost as an Independent Variable". A model has been developed to establish cost and performance trade-offs as development progresses, allowing for progressive refinement of design characteristics within overall affordability constraints;
   - The assessment of an "Integrated Subsystems" approach, based on new technology, as an alternative to acquiring and linking together separate "traditional" subsystems;
   - "Key Technology Maturation Programmes" - essentially programme-directed research aimed at generating the technology needed for the "Integrated Subsystems" approach; and
   - Commitment to through-life cost disciplines at the Concept Demonstration Phase, under the direction of a joint United States/United Kingdom Logistics Advisory Council.

6. The next phase of the programme, Engineering and Manufacturing Development, is scheduled to begin in 2001. To participate fully in the process of downselecting to a single airframe prime contractor, and in negotiating contract terms with that contractor, the United Kingdom was asked to signal its intention to enter the Engineering and Manufacturing Development phase prior to the commencement of the downselection process in early 2001 and has duly done so with a Memorandum of Understanding signed in January 2001. This Memorandum of Understanding conveys United Kingdom commitment only to the Engineering and Manufacturing development phase of JSF (and financial contributions arise only once Engineering and Manufacturing Development contracts are let by the United States). Further Memoranda of Understanding will need to be agreed with the United States for later production and support phases, which will be preceded by the necessary United Kingdom Ministerial considerations and approvals in the 2005/6 timeframe. This "tailoring" of the usual Smart Acquisition approval process will ensure that the United Kingdom does not get ahead of the United States in project approval terms.

Financial Impacts

7. Because significant funding was required to commit to the Concept Demonstration Phase, a "mini-COEIA" was carried out in 1995. This was based on different operational assumptions than will likely apply when the full COEIA is conducted (most notably, the United Kingdom requirement was then assumed to be 60 aircraft, as opposed to the current figure of up to 150). The mini-COEIA suggested that a United Kingdom-only programme would be between 60 and 105 per cent more expensive than United Kingdom participation in JSF, and JSF also compared favourably on cost grounds against variants of existing aircraft such as Eurofighter and the F/A 18. However, the mini-COEIA also suggested that it would be around 4 per cent cheaper to buy JSF directly from the United States rather than to participate with the United States in a joint programme. Against this had to be set the greater influence that the United Kingdom would have as a full member of the JSF programme in acquiring an aircraft to meet its specific requirements. A full COEIA was completed during 2000 as part of the Business Case for a solution to the Future Carrier Borne Aircraft requirement. It confirmed that, on a discounted whole life cost basis, participation in the Engineering and Manufacturing Development Phase of the JSF programme was the most cost effective solution to meet the requirement.

8. For the Concept Demonstration Phase, the United Kingdom negotiated to fund 10 per cent ($200 million) of the $2 billion target cost of this phase. The upcoming Engineering and Manufacturing Development Phase is estimated to cost some $25 billion (£15 billion) with the United Kingdom providing funding worth £1.3 billion with a further £600 million for United Kingdom specific aspects.

Wider Impacts

9. From the Department's perspective, United Kingdom involvement in the JSF programme illustrates both the benefits and the disadvantages of Anglo-American defence co-operation. On the plus side, the United Kingdom has done well to secure full member status in what is potentially the world's largest potential military equipment programme (estimated at over $220 billion). If United Kingdom commitment is sustained, the Department will expect to benefit from significant economies of scale and from the programme's explicit emphasis on affordability. Although programme leadership will reside in the United States, United Kingdom industry will benefit from access to groundbreaking new technologies. Further benefits would accrue from export orders if JSF becomes the future world-standard multi-role combat aircraft.

10. On the downside, the United Kingdom has to contend with United States domination of the programme at both government and commercial levels, resulting from the sheer scale of United States development activity and financial commitment. There are inevitably risks involved: for example; Congressional interference; designs not being optimised to meet United Kingdom requirements; United States authorities withdrawing funding from the programme or declining to commit to future phases; United States payment regimes compromising value for money. However, if United Kingdom withdraws from the programme, this may signal to the United States that individual European nations are simply unable to participate as full partners in transatlantic defence equipment programmes. This would in turn tend to polarise defence equipment co-operation between American and European blocs, and to narrow United Kingdom acquisition choices to either European co-operation or off-the-shelf purchases from the United States.

Appendix D

Proposals for Monitoring OCCAR's Performance

The proposals set out below reflect the current role and mandate of the Director of OCCAR, and his relationship with Programme Managers and their respective Programme Committees

It is proposed that on formal adoption of a programme by OCCAR, the Director should negotiate a Service Level Agreement between the Programme Manager and the relevant Programme Committee (the "Customer") based on key Performance Indicators for Cost, Timescale, Equipment Performance and Administrative Efficiency. For Cost, Timescale and Equipment Performance, these should be based on the relevant approval documents. For each Indicator, we recommend establishing a Target specifying the minimum acceptable performance that the Programme Office would be expected to achieve, and against which the Programme Manager would be held accountable. Additionally, a "Stretched" Target should be established as a challenging level of performance that the Programme Office might realistically achieve.

A fifth Performance Indicator should be established on OCCAR's Central Office, to monitor the overhead it represents on equipment programme management.

Details of the proposed Performance Indicators, Targets and Stretched Targets are set out over.

Area	Performance Indicator	Approach	Target	Stretched Target
Programme Cost	**Outturn Cost against Approved Expenditure**	For programme phases jointly approved by OCCAR partner nations, latest estimated costs to completion (including sunk costs) should be measured against the aggregate cost of each programme phase as estimated at the time of its approval. Costs to completion and aggregate approval costs should be expressed in a denominated currency and baselined or uplifted using agreed exchange rates and price indices. Where programme phases have been re-approved (as, for example, where originally approved estimates have been exceeded), the re-approval figure is to be excluded from the aggregate approval cost, *unless* the re-approval was explicitly envisaged in the original acquirement strategy. Costs to completion and aggregate approval costs should relate only to the common elements of each programme, and should not include variances resulting from rescoping or descoping the common element of each programme.	A nil or negative percentage overrun of estimated outturn costs against estimated expenditure at approval, both expressed at a 90 per cent confidence level.	A nil or negative percentage overrun of outturn costs against estimated expenditure at approval both expressed at a 50 per cent confidence level.
Programme Timescale	**Achieved In-Service Date against originally Approved In-Service Date**	The most recently forecast date for the programme to deliver equipments to service should be compared with the forecast In-Service date at the time the Main Investment decision was jointly approved by OCCAR partner nations. (For programmes in their early phases, the most recently forecast date for the Main Investment decision to be taken should be compared with the date of the Main Investment decision as forecast when the initial programme phase was jointly approved.) To allow for meaningful comparison, the definition of the In-Service Date must remain consistent throughout the programme, and should be based on the delivery of specified elements of capability to *all* nations participating in the programme.	Nil or negative slippage against the originally forecast In-Service date (or Main Investment decision date) Original and most recently forecast In-Service Dates (or Main Investment decision dates) should be reported at a 90 per cent confidence level.	Nil or negative slippage against the originally forecast In-Service Date (or Main Investment decision date). Original and most recently forecast In-Service Dates (or Main Investment decision dates) should be reported at a 50 per cent confidence level.
Equipment Performance	**Performance Levels on Entry-to-Service against the Endorsed Requirement**	At the time that the Main Investment decision is jointly agreed, OCCAR partner nations should define a series of measurable capability features for which specified levels are set for (i) fully compliant performance; (ii) partially compliant performance; and (iii) unacceptable performance on Entry-to-Service. As the programme progresses, these levels should be used to benchmark performance expected to achieved by the most recently forecast In-Service Date (reported at a 50 per cent confidence level). (For programmes in their early phases, a similar set of benchmarks should be agreed at the time the initial programme phase is approved in respect of the performance expected to be achieved by the most recently forecast Main Investment decision date (reported at a 50 per cent confidence level)).	A complete set of capability features levels that are either (i) fully compliant; or (ii) partially compliant against the specified performance measures. Partially compliant features should be those that are tradable against over-compliances, or otherwise judged likely to be acceptable to all partner nations on Entry- to-Service.	A complete set of fully compliant capability features.
Administrative Efficiency	**Annual percentage Reduction in Programme Office Operating Costs**	The annual operational budget for each OCCAR Programme Office (covering staff and associated costs, not equipment expenditure) will be derived from a "baseline" reflecting the stage each programme has reached, and the consequent level of resources required, to which the Programme Manager, Programme Committee and OCCAR Director will apply an agreed percentage reduction. The percentage will reflect prior year achievement against the agreed savings target, targets agreed for comparable equipment programmes, the stage the programme has reached, and assessed levels of programme risk.	To achieve outturn annual Programme Office expenditure within the "baseline" budgetary figure, less the agreed x per cent	To achieve outturn annual Programme Office expenditure within the "baseline" budgetary figure, less (say) 1.5x per cent.
Administrative Overhead	**Central Office Percentage Overhead**	OCCAR Central Office costs should be calculated as a percentage of total OCCAR operational costs (ie including those of the Programme Offices). An agreed reduction in the level of this percentage should be established as an annual performance target for OCCAR Central Office efficiency. The annual percentage reduction will reflect achievement against the prior year target, total estimated annual operational costs, and the number and phases of programmes under OCCAR management.	To achieve the agreed annual y per cent reduction in OCCAR Central Office costs, expressed as a percentage of total OCCAR operational costs.	To achieve (say) a 1.5y per cent reduction in OCCAR Central Office costs, expressed as a percentage of total OCCAR operational costs.