

# A Case Study of Stores Management in the Ministry of Defence



Report by the  
Comptroller and Auditor General

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Ministry of Defence

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HC 951 Session 1997-98  
Published 24 July 1998

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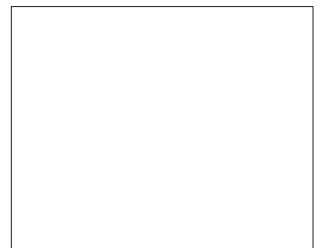
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**CONFIDENTIAL — FINAL REVISE**

*to be published as House of Commons Paper 951 by The Stationery Office Ltd*

*Price £0.00*

This report is issued on the strict understanding  
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**00:01 hours on Friday 24 July 1998**

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Comptroller and Auditor General

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# **A Case Study of Stores Management in the Ministry of Defence**

Ordered by the  
House of Commons  
to be printed 22 July 1998

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

*John Bourn*  
Comptroller and Auditor General

National Audit Office  
20 July 1998

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## Executive summary

**1** The Ministry of Defence (the Department) hold non-explosive items valued at £11 billion in their major stores depots. To assist the Department in their continuing work to strengthen further their overall management of their inventory, we looked in detail at one aspect - the management of hazardous items. Other than explosive stores such as ammunition and missiles, the Department hold some 18,000 types of hazardous items, worth over £450 million. Hazardous items present risks to people, property and the environment, so they require special handling and storage.

**2** To explore matters which would provide lessons of wider relevance to the Department's management of other items, we concentrated on the generality of hazardous stores - repairable items which include hazardous components, and a range of consumable materials such as compressed gases, paints and adhesives. We examined:

- how the Department might reduce the costs of using hazardous items (Part 2);
- the Department's arrangements for health, safety and environmental protection (Part 3).

## Main findings and recommendations

**3** In recent years the Department have given considerable attention to the management of their stores holdings generally, although not specifically hazardous items. They have extended the use of purchasing arrangements which allow them to reduce stock holdings, achieved greater co-ordination of purchasing for the three Armed Services, and closed some 40 storage depots. As part of the Strategic Defence Review the Department intend to achieve further rationalisation and integration. They are also continuing to develop their health and safety and environmental protection arrangements, and are planning to integrate the two. In taking forward their management of hazardous items, the following aspects particularly merit the Department's attention.

### Recommendation 1

We recommend that the Department explore the scope to extend the use of enabling arrangements and direct supply contracts for buying hazardous items, particularly consumable items.

**4** In the right circumstances, enabling arrangements and direct supply are cost efficient alternatives to buying bulk and storing until needed. Enabling arrangements allow the Department to buy items closer to the time they are required, and direct supply from suppliers to users avoids the need to hold items in central depots. The Department are already looking to make more use of such arrangements generally, and our analysis suggests that there may be worthwhile benefits from doing so for hazardous items - lower stock levels, and less risk of losses from 'shelf lived items'. However, the Department need to consider the overall financial implications on a case by case basis (including the loss of bulk discounts and higher prices to reflect suppliers' storage and distribution costs) and the operational implications.

### Recommendation 2

We recommend that the Department review their slow moving items to see if they are still needed, and dispose of any surplus stock.

**5** Slow moving stock can indicate that holdings exceed requirements, although in some cases it represents stock which may be required for contingency purposes. The Department have stocks of hazardous items worth some £250 million which, on current demand, are sufficient to last for more than ten years. Two thirds of these slow moving items are to be stored in the new £9 million building for hazardous stores at Donnington.

### Recommendation 3

We recommend that the Department examine the scope to reduce the time taken to order and deliver items.

#### Recommendation 4

We recommend that the Department improve the availability and quality of their management information.

**6** The Department hold lead-time stock to meet demand that may arise whilst they await delivery of re-ordered stock (the lead time). However, they are not making the most effective use of enabling arrangements to manage lead times, which for the Royal Air Force are some 12 months, and may consequently be holding more stock than necessary.

#### Recommendation 5

We recommend that in their work to strengthen their arrangements for managing health and safety and environmental protection, the Department give specific attention to hazardous stores.

**7** At present the Department do not have sufficient information to ensure that they avoid duplicating items, either where the Services purchase the same item or where new items are bought when the requirement could be met from items already on the Department's inventory. Information is also not readily available to compare the performance of storage depots and to identify the full costs of holding hazardous items.

**8** The Department were undertaking health and safety audits at the sites we visited. They were also carrying out environmental protection monitoring, and are currently developing Environmental Management Systems which will provide a framework for a programme of environmental audits from 1999. However, the Armed Services have different audit approaches, which reduces the comparability of results.

**9** At the sites we visited stores facilities for hazardous items have either been, or are being, purpose-built or specifically modified. However, there were instances of non-compliance with statutory requirements. One building in particular - the battery store at Portsmouth - posed serious health and safety risks, and facilities at Donnington, RAF Wittering and the Army's Wattisham Airstation also raised concerns. The Department have confirmed that they have now addressed the problems noted during our visits.

### Recommendation 6

We recommend that the Department continue to explore opportunities to substitute less hazardous alternatives where possible and monitor their overall usage of hazardous items.

**10** The Department have identified ways of reducing their use of hazardous items, and in some cases have eliminated their use. Some of these are relatively low cost measures, while others are more costly and may give savings only in the longer term. The Department do not, however, monitor their overall use of hazardous items, and there may be merit in their examining practice in the United States Department of Defense.

## Concluding comments

**11** It is difficult to assess the full potential for savings from general improvement in the management of hazardous stores, including performance monitoring. The Box on page 42 summarises the specific areas in which we believe there is scope for savings and, where possible, gives illustrative figures. The savings fall into the following categories:

- a) Reduced expenditure on new stock.** Where the Department are likely to have a continuing requirement but could manage with less stock, the process of running down stock by reducing expenditure on re-ordering would yield one-off savings. For example greater use of direct supply could provide savings of £30,000 to £100,000 for every £1 million of stock issued, and there could be savings of £1.6 million to £4 million for the Royal Navy and Army alone if an additional 10 per cent of their stock were purchased on enabling arrangements.
- b) Reduced risk of items passing their shelf life.** The Department hold some £36 million of stock which is at risk of passing its shelf life before being issued, although in some cases this represents stock which may be required for contingency purposes. We estimate that greater use of enabling arrangements would reduce the value of stock at risk by over £400,000 for every £1 million of stock.
- c) Disposal of surplus stock.** Every one per cent of replacement value of slow moving stock realised at sale would provide receipts of £2.5 million. However, the Department consider that there is little scope for selling their slow moving stock and that any sale proceeds would be low.

- d) Removal of contract duplication.** Savings could flow from minimising management effort in letting contracts and in ensuring that stock is purchased at the lowest price.
- e) Reduced holding costs.** With reduced stockholdings, the Department would save interest on capital - that is, the amount of money tied up in stock - and storage costs. In time there might also be an impact on the Department's overall requirements for storage capacity.

**12** The management of hazardous items is an area which merits a specific focus in the Department's continuing work to strengthen the management of their overall inventory, achieve efficiency savings and reduce environmental risks. Whilst the findings in this report relate specifically to hazardous items, several of the findings have a wider relevance to the Department's management of their full inventory and could help them achieve further savings as they take forward the work of their Strategic Defence Review.

## Part 1: Introduction

**1.1** The Ministry of Defence (the Department) hold non-explosive items valued at £11 billion in their major stores depots. These stocks comprise major equipments, equipment related items and consumable items. The Department hold stocks for two main reasons:

- to provide a timely and cost-effective supply to users; and
- to maintain strategic stocks, for example war reserves.

**1.2** In recent years the Department have given considerable attention to their inventory management and stockholdings. For example, they have closed storage depots and plan to close more. They have extended the use of purchasing arrangements which allow them to reduce stockholdings and save money. And they have taken steps to achieve greater co-ordination of purchasing for the three Armed Services. As part of the Strategic Defence Review the Department are reviewing logistic support across all three Services with the intention of achieving further integration and rationalisation of facilities.

**1.3** To ensure that our work would contribute to the Department's continuing efforts to further strengthen their inventory management, we decided to look in detail at a particular area of activity, but one which would enable us to draw out general messages. In discussion with the Department, we selected the management of 'hazardous items' because of the additional risks and costs which the Department have to manage in acquiring and using such items. By definition hazardous items present risks to people, property and the environment. Also, they can cost more to hold than many conventional items because of the



A range of hazardous items, including lead-acid and nickel-cadmium batteries, together with packaging and labelling facilities.

need to comply with health and safety and environmental protection legislation. Hazardous items require special handling and storage, and disposing of surplus items can be costly because of the safeguards required - in some cases disposal costs can exceed the initial cost of purchase.

**1.4** To explore matters which would have wider relevance to the Department's inventory management, we concentrated on the generality of hazardous stores - see Figure 1 for examples of hazardous items. We did not, therefore, examine in detail the Department's response to their specific obligations on the Montreal Protocol (Appendix 4), or the special strategic considerations which apply to the availability, storage and processing of ammunition, missiles and explosives, which are held in specialised Armament Depot facilities. For similar reasons we excluded bulk stocks of petrol and oil. These areas could, however, be the subject of future work. For the purpose of this examination, we concentrated instead on:

**Examples of hazardous items in the Department's inventory**

**Figure 1**

<i>Class<sup>1</sup></i>	<i>Hazard Description</i>	<i>Example Item</i>
1(2)	Explosives	Detonators; Fireworks; Flares
2	Compressed Gases	Oxygen; Acetylene; Chlorine
3(2)	Flammable Liquids	Paints; Adhesives; Solvents
4	Flammable Solids	Firelighters; Charcoal; Lithium Hydride
5	Oxidising Substances	Calcium Hypochlorite; Fibre Glass Repair Kit
6	Toxic and Infectious Substances	Paint Remover; Insecticide; Disinfectant; Chlorinated Solvents
7	Radioactive Substances	Beta-Light; Luminous Watches
8	Corrosive Substances	Lead-Acid Batteries; Sodium Hydroxide; Acids
9	Miscellaneous Dangerous Substances	Lithium Batteries; Asbestos; Chloro-Fluoro-Carbons

- Notes: 1. The Department follow the United Nations system for classifying hazardous items.  
2. Bulk fuel, ammunition and explosives are not examined in this report (paragraph 1.4). Some equipments, however, may contain components which are explosive in nature, and these items form part of the inventory examined in this report.

Figure 1 shows examples of hazardous items held by the Department, categorised under the United Nations classification of hazards.

Source: Ministry of Defence



- **repairable** items which include hazardous components - for example a spare radio set or a chemical agent monitor; and
- a range of **consumable** materials which are themselves hazardous - for example compressed gases, flammable items, and poisonous substances such as insecticides.

In June 1997 the Department held depot stocks of a range of some 18,000 such items, which were worth £455 million, with over 80 per cent by value held at their four main depots (Portsmouth, Bicester, Donnington and Stafford).

**1.5** Against this background, we examined:

- how the Department might reduce the costs of using hazardous items (Part 2); and
- the Department's arrangements for health, safety and environmental protection (Part 3).

**1.6** The examination involved:

- a) visiting the Department's four main stores depots where hazardous items are held, and seven end-user sites. These locations, selected in discussion with the Department, are listed below. The visits involved physical inspection of the storage and use of hazardous materials, examination of records and interviews with key staff;

<b>Ministry of Defence sites visited by the National Audit Office</b>		
<i>Service</i>	<i>Site Name</i>	<i>Principal Role</i>
<b>Depots</b>		
Royal Navy	Royal Naval Supply Depot - Portsmouth	Principal hazardous store
Army	Base Ordnance Depot - Bicester	Storage of hazardous consumable items
Army	Base Ordnance Depot - Donnington	Storage of hazardous repairable items
Royal Air Force	RAF Stafford	Principal hazardous store
<b>End-users</b>		
Royal Navy	Royal Fleet Auxiliary - Fort Victoria	Resupply of Naval ships at sea
Army	Colchester Garrison	24 Airmobile Brigade headquarters
Army	Wattisham Airstation	Army Air Corp Barracks

continued...

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**Ministry of Defence sites visited by the National Audit Office *continued***

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<i>Service</i>	<i>Site Name</i>	<i>Principal Role</i>
<b>End-users</b>		
Royal Air Force	RAF Marham	Strike Command Tornado base
Royal Air Force	RAF St Athan	Principal Royal Air Force maintenance facility
Royal Air Force	RAF Wittering	Strike Command Harrier Base
Defence Evaluation and Research Agency	Defence Evaluation and Research Agency, Farnborough	Headquarters of the Defence Evaluation and Research Agency

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- b)** assessing the Department's performance against the criteria shown in Appendix 2;
- c)** collecting and analysing data about the Department's hazardous stores inventory, and in doing so developing analyses, shown in Part 2, which were not previously available to the Department. We are grateful to the Department for their assistance in generating data, many of which were not readily available;
- d)** commissioning AEA Technology to provide advice on inventory management, and to facilitate workshops with the Department's staff to identify risks associated with the management of hazardous stores. These discussions - the results of which are summarised at Appendix 3 - informed much of our subsequent analysis of the Department's management arrangements. AEA Technology also provided expert comment on the Department's health, safety and environmental protection arrangements;
- e)** drawing on the experience of the United States Department of Defense in managing their hazardous stores, including visiting the United States Air Force at RAF Mildenhall; and
- f)** visiting British Airways PLC and Shell Chemicals UK Ltd to discuss their approaches to the management of hazardous materials.

We are grateful to these organisations for their contribution. In developing our analyses we drew on other countries' national audit offices' work on inventory management, particularly the United States General Accounting Office and the Australian National Audit Office (Appendix 5).

## Part 2: Reducing the costs of using hazardous items

**2.1** This Part examines how the Department manage the provisioning and storing of hazardous items, and the scope for reducing their costs, focusing specifically on the aspects set out below. Figure 2 shows how these fit into the overall supply process for hazardous items.

### The aspects of the management of hazardous items examined in this Part

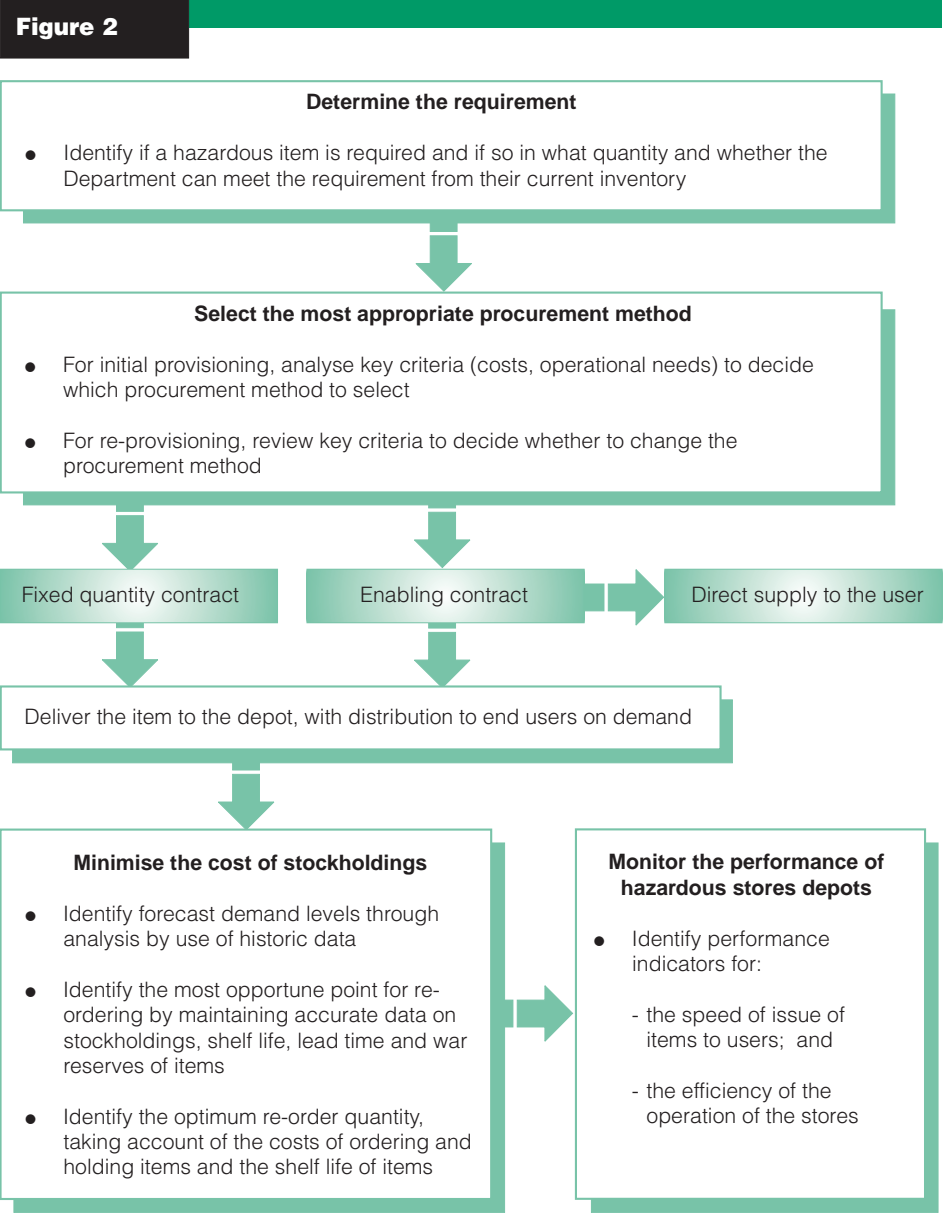
- 
- The inventory of hazardous items.
  - Determining the requirements for hazardous items.
  - The methods used to buy hazardous items.
  - Minimising the costs of holding hazardous items.
  - Measuring the performance of depots.
- 

**2.2** The Department operate separate stores computer systems for each Service. Most inventory data are held on these computer systems and can be readily analysed. Individual inventory managers hold other data and these could not be gathered in a timely or cost effective way for our overall analysis. In this Part therefore our examination is based on data drawn from the Department's stores computer systems, and analyses are sometimes presented for one or two of the Services rather than for the Department as a whole. Rationalisation of computer systems is being addressed as part of the Strategic Defence Review.

### The inventory of hazardous items

**2.3** Overall at their depots, the Department hold some 18,000 types of hazardous items with a replacement value of some £455 million. They hold some £38 million of this stock (8 per cent) as 'war reserves'. These items are held to meet urgent operational requirements, so our analysis focused on the remaining £417 million of stock.

The supply process for hazardous items



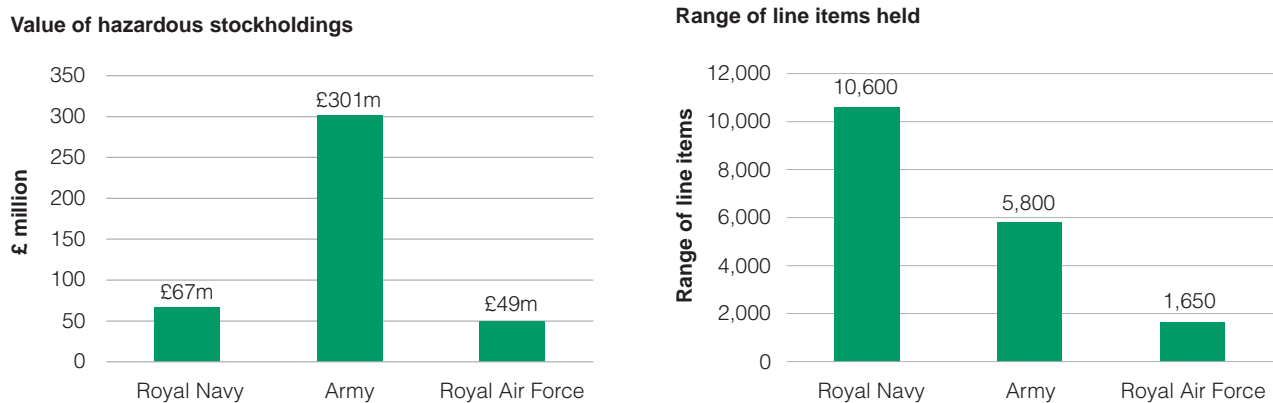
Source: National Audit Office analysis

This figure shows the key stages in the supply process for hazardous items, highlighting three procurement methods.

**2.4** Differences in the three Services' activities are reflected in the range and value of their holdings (Figure 3). For example, the Royal Navy, with a wider range of items than the other Services, hold many low value components, such as screws and bolts, which are treated with hazardous substances to improve their reliability at sea. In contrast, the Army, with the highest value of hazardous stocks, hold more high value items such as thermal imaging equipment.

**Figure 3**

**Analysis of depot holdings of hazardous items - value and number of line items held as at June 1997**



Note: Figures exclude items held as 'war reserves' to meet urgent operational requirements.

Source: National Audit Office analysis

This figure shows that although the Army hold most of the hazardous materials by value, the Royal Navy have the greatest range of items.

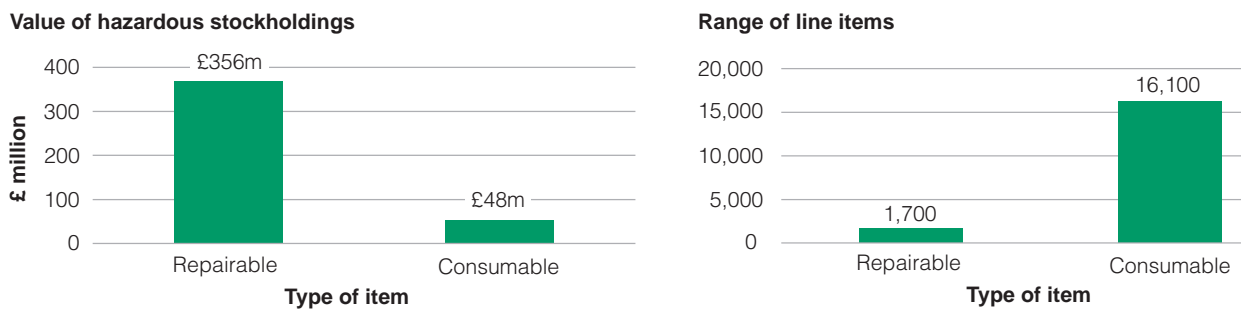
**2.5** The Services hold two categories of hazardous items:

- a) repairable items** - either whole equipments (such as chemical detectors), or equipment parts (such as beta lights in helicopter doors or asbestos insulation linings in engines) which contain hazardous materials. While the hazardous component may be only a small part of the whole item, under health and safety legislation the whole item must be treated as hazardous. As the Services repair and maintain these items they are classified as 'repairables'; and
- b) consumable items** including paints, batteries, adhesives and cleaning materials which are needed to maintain the operational effectiveness of equipment. Some of these items are commercially available while others are specially procured.

**2.6** Figure 4 breaks down the depot holdings of hazardous items into repairable items and consumable items.

**Figure 4**

**Analysis of the Department's depot holdings of hazardous items - value and number of line items held as at June 1997**



Note: This analysis excludes some £13 million (250 line items) which are categorised as 'limited life' items, which have some characteristics of both repairables and consumables.

This figure shows that although some 16,100 hazardous items (90 per cent) are classified as consumables, repairable items make up some £356 million (85 per cent) of the value of stock held.

Source: National Audit Office analysis

**2.7** Figure 5 outlines the responsibilities of those personnel involved in provisioning, depot storage and use of hazardous stores. For repairable items the Procurement Executive undertake the initial provisioning and determine in conjunction with the equipment support authorities the initial requirement for in-service support, including spares. Reprovisioning of repairable items, and the purchase of consumable items, is undertaken by the provisioning and equipment support authorities.

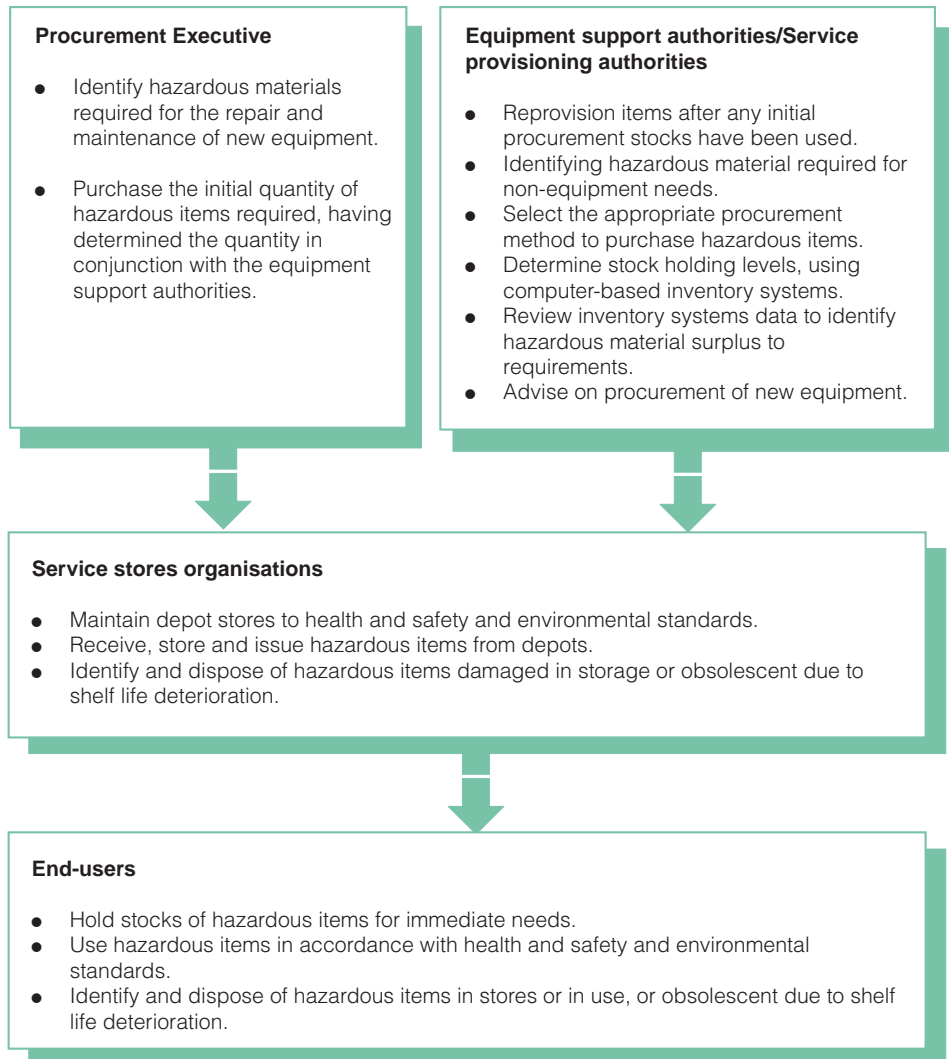
## Determining the requirements for hazardous items

**2.8** As part of the Department's health and safety and environmental policies, all approval submissions for new equipments must identify whether the equipment will comply with current and foreseen legislation.

**2.9** The Control of Substances Hazardous to Health Regulations 1994 identify the importance of examining the need for hazardous items and, where possible, replacing them with safer items. And legislation puts a duty on manufacturers to use less hazardous or non-hazardous materials where possible. As regards items already in use, there can be difficulties in proposing alternative (possibly less hazardous) materials as, in certain cases, substitution might affect the manufacturers' warranties.

**Responsibilities for  
managing hazardous  
items**

**Figure 5**



Source: Ministry of Defence

This figure shows the parties involved in the management of hazardous materials, together with their responsibilities.

**2.10** For new items and equipments containing hazardous materials, the Department operate procedures which aim to control overall numbers.

- a) The Department's Standing Committee on Hazardous Stores have a remit to oversee the introduction of new hazardous items and processes. In the 18 months between September 1996 and March 1998 the Committee looked at the health and safety aspects of new items, but did not consider the scope for reductions in the numbers of hazardous items.
- b) The Department are now focusing on ways to minimise the use of hazardous materials. For example, they have identified a number of hazardous items which project managers should review the need for when considering new equipments.
- c) The Department also require contractors to provide plans for the safe operation and maintenance of equipment, including any hazardous materials.

**2.11** The Department do not, however, monitor the numbers of hazardous items in their inventory or whether new equipments use fewer hazardous items than comparable equipment already in service. As more items are now designated as hazardous, such analysis would require careful interpretation. We noted that the United States Department of Defense do monitor overall numbers of hazardous items, and the impact of their procedures for minimising use, tracking, storing, handling and disposing of hazardous materials.

**2.12** Duplication of items within the inventory as a whole can result in a duplication of management effort, for example in letting contracts and managing separate stock holdings. In 1991, the Department examined the costs of duplicating items in their entire inventory and estimated that on average each duplication cost £420 a year (at 1997-98 prices).

**2.13** To reduce the risk of duplicating an item, the Department aim to let one contract for all users through either a central contracts branch or by designating one Service as the sole procurer. However, we noted that for some 200 hazardous items held by both the Royal Navy and the Army (less than two per cent of the range of items held by the two Services), the two Services recorded different prices for the same item, because they bought items either under different contracts or at different times. The Department acknowledged that, when making new purchases, the Services do not know what other Services are buying and therefore there is a risk of contract duplication. To illustrate the potential for savings in this



area, we calculate that if 10 per cent of items recorded at a different price could have been bought at the lower price, the saving would have been some £50,000 a year.

**2.14** The Department's Defence Codification Agency give each line item a unique reference number to reduce the risk of duplication, and as there is a risk that items may possess the same characteristics, they maintain a central database of items' characteristics. The Agency use the database to look for duplication both in requests for new items and within the existing inventory:

- a) Where the Agency have data on the characteristics of new requirements, they check to see if the requirements can be met from items already on the inventory. The Agency estimate that about half the new requirements are met from their existing inventory.
- b) The Agency also examine items within the Royal Navy's existing inventory for possible duplication. In 1997-98, they reviewed some 90,000 hazardous and non-hazardous items in the Royal Navy's inventory and found some 2,700 instances of duplication. The possible costs of duplication referred to in paragraph 2.12 suggest removing this duplication may save the Department some £1.1 million a year. Against this must be set the staff costs of identifying this duplication - some £230,000.
- c) The Agency do not look for duplication in the Army and Royal Air Force existing inventories. These two Services undertake their own checks to look for possible duplication. However, they did not have a record of how many duplicate items they found in 1997-98.

**2.15** As regards the Department's 18,000 types of hazardous items, there is a risk of duplication as the Agency do not have complete data on specifications:

- a) In 1997 the Agency found some 4,500 hazardous and non-hazardous items recorded on the Services' stores computer systems that were not recorded on their characteristics database.
- b) We found that for the Department's whole inventory, there were some 9,500 hazardous and non-hazardous items that had been on the database for at least 6 months but where no specification data were recorded.

## Key Points

### 2.16 Key points on determining the requirements for hazardous items:

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- a) There are some 18,000 types of hazardous items worth in total £455 million in the Department's depots, of which some £38 million are held as war reserves.
  - b) The Department are not able to demonstrate whether they are reducing the number of hazardous items included in new equipments.
  - c) In some cases more than one Service has bought the same hazardous item at different prices. There may be scope for administrative savings and bulk discounts, and if 10 per cent of these items could have been purchased for the lower price, there would have been savings of £50,000 a year.
  - d) The Department hold data to determine whether they can meet new requirements from their existing inventory of hazardous and non-hazardous items. They look to prevent the purchase of items already on the inventory and to identify duplication within their existing holdings. However, the data are incomplete and the Services separately review their inventories with the Defence Codification Agency only reviewing the Royal Navy's inventory. The Department could do more here.
- 

## The methods used to buy items

2.17 There are three methods of buying items:

- **fixed quantity contracts** - a single bulk purchase, with items delivered to depots for distribution to users on demand.
- **enabling arrangements** - items are bought only as and when required, and are delivered to depots for distribution to users on demand.
- **direct supply contracts** - the same as enabling arrangements, but with suppliers delivering items direct to users.

2.18 To decide which procurement method represents the best value for money the Department need to weigh operational needs (including the importance they attach to certainty of availability and speed of delivery) and the costs. Taut management of enabling arrangements and direct supply contracts would reduce stock holdings and might allow for increased use of 'just in time' delivery, but the risk of stock not being available may be unacceptable for the Department, and these procurement methods may not be suitable for some items of defence stores.

Figure 6 sets out the elements of cost for each method, but for a given item the actual cost will depend on a number of factors. For example, whilst bulk purchases under fixed quantity contracts could offer lower prices than the other methods, enabling arrangements allow items to be ordered and paid for closer to the time they will be needed by users, so reducing the amount of capital tied up in stored material and thus transferring some of the inventory management risks to suppliers. And whilst direct supply means the Department do not have to store and distribute items to end users, the suppliers do, and this will be reflected in their prices.

**The elements of cost to  
the Department for the  
three procurement  
methods**

**Figure 6**

Procurement method	<i>Fixed quantity contract</i>	<i>Enabling arrangement</i>	<i>Direct supply contract</i>
<b>Cost elements of procurement method</b>	Contract price	Contract price	Contract price (including any premium for storing and distributing items to end users)
	Administration costs: annual contract let	Administration costs: tri-annual contract let in-year re-provisioning	Administration costs: tri-annual contract let
	Storage of bulk quantities at central depot	Storage of limited quantities at central depot	Storage of items at users
	Storage of items at users	Storage of items at users	
	Distribution to users, including transport costs	Distribution to users, including transport costs	
	Cost of shelf life items becoming unusable	Cost of shelf life items becoming unusable	

This figure shows the cost elements of each procurement method. With fixed quantity contracts and enabling arrangements, the Department incur central depot and distribution costs. For direct supply contracts these costs are transferred to the contractor and are likely to be reflected in the contract price.

Source:  
National Audit Office analysis

**2.19** The different characteristics of repairable and consumable items may affect the procurement method. For example, repairable items tend to be complete equipments or major components, with longer lead times, and may be available only from a single supplier. So the Department have traditionally purchased these items on fixed quantity contracts and often as part of the initial purchase of the equipment to which they relate. In contrast, consumable items tend to be more readily available from suppliers.

**2.20** The Department recognise, however, the potential benefits of examining alternative procurement methods. The Army have recently undertaken a preliminary analysis which suggests that in time fixed purchase contracts might account for some 25 per cent of their overall inventory (hazardous and non-hazardous) issues by value, compared with 90 per cent at present. Some 50 per cent might be placed on enabling arrangements, and 25 per cent on direct supply.

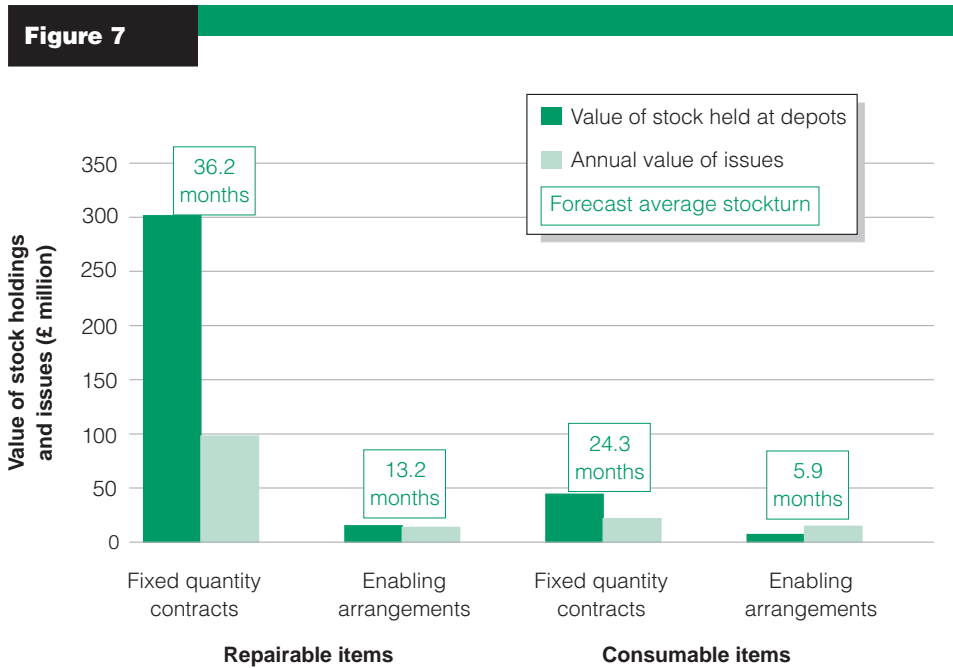
### **Extending the use of enabling arrangements**

**2.21** While some 90 per cent of the Royal Navy's and Army's depot stock was originally bought under fixed quantity contracts, enabling arrangements do have some benefits over fixed quantity contracts. These benefits come largely from:

- holding less stock; and
- reducing losses from 'shelf lived' items - that is, stock that deteriorates and becomes unusable over time.

**2.22** Under enabling arrangements, it is possible to **hold less stock** at depots. For the Department’s existing stock, the average forecast stockturn (the time it will take for current stock to be issued to users) was significantly shorter for items bought under enabling arrangements than for those bought under fixed quantity contracts (Figure 7).

The procurement methods used by the Royal Navy and the Army for consumable and repairable hazardous items



Note: This information is derived from the Services stores computers. It excludes items held by the Royal Air Force as data on their procurement methods were not readily available.

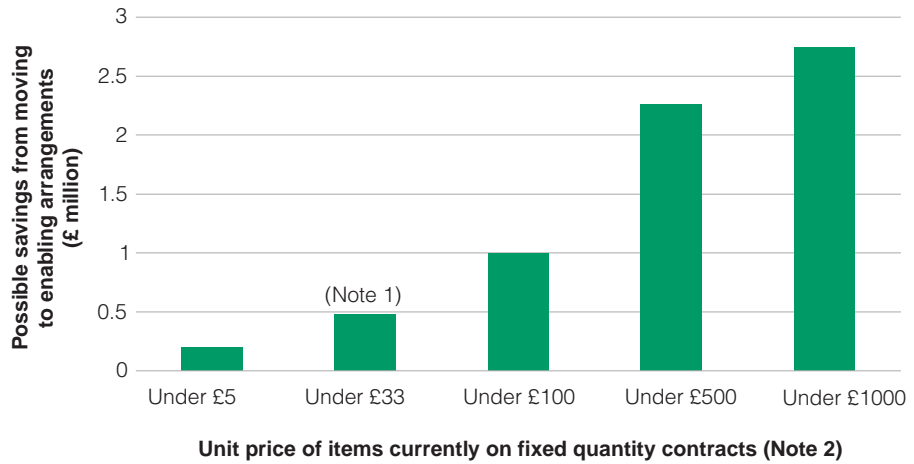
This figure shows the value of stock held at Royal Navy and the Army depots, annual issue and forecast stockturn (the time it will take for all current holdings to be issued) both for consumable and repairable hazardous items.

Source:  
National Audit Office analysis

**2.23** To illustrate the potential financial benefit of extending the use of enabling arrangements for consumable items, Figure 8 shows the gross savings if 10 per cent of items currently bought on fixed quantity contracts could be transferred to enabling arrangements (assuming a requirement to replenish current stocks as they run out). Enabling arrangements have tended to be used for lower value items than those bought under fixed quantity contracts (although some items cost over £1,000, half cost less than £5 and the average is £33 - compared with an average of £145 for fixed quantity contracts) and the unit prices used for the illustration in Figure 8 reflect the value of items already on enabling arrangements. The illustrative one-off savings range from £0.2 million to £2.7 million, which would come from lower stockholdings and reduced interest on capital.

Possible savings if  
10 per cent of items  
currently on fixed  
quantity contracts could  
be moved to enabling  
arrangements

**Figure 8**



- Notes:
1. £33 is the average price of consumable items currently on enabling arrangements.
  2. This information is derived from the Services stores computers. It excludes items held by the Royal Air Force as data on their procurement methods were not readily available.

Source:  
National Audit Office analysis

This figure illustrates the savings that the Department could achieve by moving from current fixed quantity contracts to greater use of enabling arrangements for consumable items. Possible savings range from £200,000 to £2.7 million.

**2.24** The average cost of repairable items is less of a guide to the likelihood of an item being on an enabling arrangement - the average for those on enabling arrangements being some £33,000, whilst for items on fixed quantity contracts it is some £12,000. However, 50 per cent of repairable items on enabling arrangements cost less than £1,600. To provide a broad illustration of the possible benefit if 10 per cent of the items up to this value which were bought under fixed quantity contracts could in future be bought under enabling arrangements (assuming the need to replenish stocks), we estimate the Department could make gross savings of £1.4 million. Achieving these savings for repairable items may, however, be more difficult than for consumables, because demands can be met from items currently in service, which users may return to depots once they have finished using them. Nevertheless, when buying new repairable items, the Department may find it useful to take account of this analysis in deciding on the most appropriate procurement method.

**2.25** Some items deteriorate with age and therefore are usable for only a limited period - their 'shelf life'. Where stock is at risk of passing its shelf life, the Department review their holdings and examine the scope for re-living stock, selling stock which has a value, or disposing of surplus stock. All of these options entail costs and in the longer term alternative procurement methods and firm inventory

management should help reduce the risks and costs. The Department recognise, however, that there is scope to do more to reduce the risks of items passing their shelf life.

**2.26** For the Royal Navy and the Army, we found that, on the basis of current forecast of demand, the Department hold some £36.5 million worth of stock, including stock containing hazardous components, which will pass its shelf life date before being issued (Figure 9) - some 64 per cent of those items with a shelf life. The values shown reflect the total value of items, although in many cases the hazardous component makes up only a small part of the whole item, and stock levels may be determined by operational factors.

**Summary of hazardous items at risk of passing their shelf life in the Royal Navy and the Army**

**Figure 9**

<i>Procurement method/type of item</i>	<i>Value of stock at risk (£'000)</i>	<i>Percentage of shelf life items (by value)</i>
Fixed quantity contracts - repairable items	27,700 <sup>(1)</sup>	80 per cent
Fixed quantity contracts - consumable items	8,600	46 per cent
Enabling arrangements - repairable items	20 <sup>(1)</sup>	7 per cent
Enabling arrangements - consumable items	180	5 per cent
<b>Total</b>	<b>36,500</b>	<b>Overall 64 per cent of shelf life items are at risk</b>

Note 1. The values shown reflect the total value of items, although in many cases the hazardous component may make up only a small part of the whole item.

This figure shows the Department hold some £36.5 million of items which are at risk of passing their shelf life. Less stock is at risk when bought under enabling arrangements than under fixed quantity contracts.

Source:  
National Audit Office analysis

**2.27** One of the benefits of extending the use of enabling arrangements is the ability to order items as and when they are required, and minimise the risk of stock passing its shelf life. In this regard, we noted that some £180,000 of consumable items (5 per cent of consumable items with a shelf life) bought under enabling arrangements was at risk of passing its shelf life, whereas some £8.6 million (46 per cent) of consumable items bought on fixed quantity contracts, was at risk of passing its shelf life. This suggests that for every £1 million of consumable items with a shelf life that the Department can in future transfer to enabling arrangements, the value of stock at risk of passing its shelf life may reduce by some

£410,000. The Department will also avoid any associated disposal costs. At Bicester, since 1990-91 the total costs of disposing of hazardous items marginally exceeded the total value of stock written off. However, where an item passes its shelf life, it may be possible to examine stock and determine if the operating life can be extended. The Department provided an illustration that showed the benefits from extending shelf life.

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### **Extending the life of items past their shelf life**

In 1997 the Department identified adhesives with a stock value of £85,500 held at the Bicester depot that had past their shelf life. After testing the items, at a cost of some £12,100, they found £7,000 of stock was unfit for use. The remaining stock (£78,500) was still fit for use. The exercise to extend the life of these items cost the Department in total £19,100 - a net saving to the Department of £66,400 (78 per cent of the stock value) although this does not include disposal costs for the stock that was unfit for use.

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**2.28** We also noted that the Department hold stocks of repairable items worth some £27.7 million which are at risk of passing their shelf life (80 per cent of repairable items that have a shelf life). As repairables are more likely to be whole equipments or major equipment components, often only a small part of the item has a shelf life. Therefore the cost of extending the life of repairable items will often be smaller in relation to the item's value than is the case for consumables.

### **Extending the use of direct supply**

**2.29** Where the Department have enabling arrangements suppliers deliver items to one of the Department's storage depots or supply direct to end users. The approach used for each item needs to be considered on its merits - whilst direct supply could reduce depot holdings, there is the risk of end users overstocking to insure against supply problems. The Resource Accounting system being introduced in 1998-99 will help identify the costs of any overstocking and end users will increasingly be held accountable. Direct supply contracts are most likely to be suitable for those users with large, regular requirements for items and with good transport links, as this poses fewer organisational difficulties for suppliers. Where users require small quantities of items at infrequent intervals, or are based in remote locations, suppliers may not be prepared to offer direct supply contracts, or may do so only for premium prices.

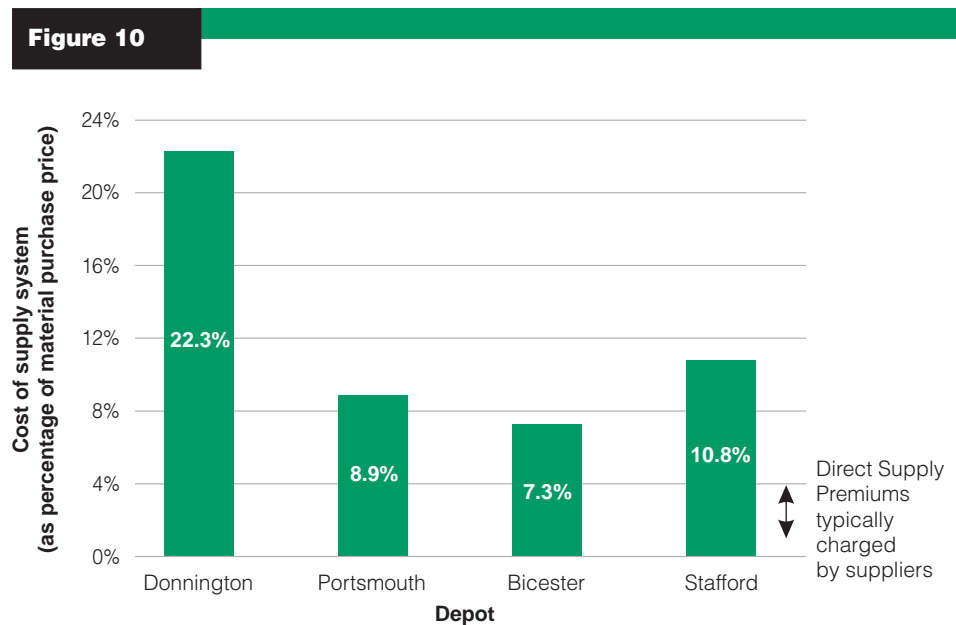
**2.30** In our report on the Procurement of Routine Items (HC 31, 1997-98) we showed, on the basis of detailed analysis of suppliers' charges, that suppliers usually charge a premium of between 1 per cent and 4 per cent of the contract price when offering a direct supply arrangement. Similar premiums are also being



offered by suppliers on some direct supply arrangements for hazardous items. For example, in 1996 the winning tenderers for two contracts for the supply of 192 paints to 22 Royal Air Force bases offered to supply all the paints on direct supply at premiums of 0 per cent and 2 per cent.

**2.31** Following on from that work, we looked at the costs of holding and distributing hazardous items through the Department's four major depots. Many of the costs of the Department's storage and distribution systems are fixed, and could only be reduced through a step change in the Department's utilisation of the facilities. However, we estimate that the average variable cost (the cost attributable to a single item) of routing items through the Department's main depots at Bicester (the main Army depot for consumable items), Portsmouth and Stafford (which both hold consumable and repairable items) ranges from approximately 7 per cent to 11 per cent of the purchase price (Figure 10). As this is higher than the direct supply premium, this suggests that savings could be made by greater use of direct supply where appropriate - between £30,000 and £100,000 a year for every £1 million of items issued which could be switched to direct supply contracts.

The estimated costs of holding and distributing items through the central depots as a percentage of purchase price, compared with the premium charged for direct supply



Note: The Donnington figures are based on the Department's forecast costs of the new hazardous store. Holding costs are significantly greater at Donnington because of the high stock levels and consequent interest costs.

This figure shows that the variable costs of the Department's supply system can be more than the premium typically charged by the private sector for providing a direct supply service, suggesting that savings can be made by going to direct supply where appropriate.

Source:  
National Audit Office analysis

**2.32** As regards the recently completed hazardous store building at Donnington, we estimate that the variable cost there will be over 20 per cent. This reflects the interest on capital on the items held at Donnington. Whilst this suggests there may be considerable savings if the Department were able to switch items to direct supply, as Donnington hold predominantly high value repairable items the Department see limited scope for direct supply (paragraph 2.19).

**2.33** We looked at the extent to which each of the three Services made use of direct supply arrangements. The position for each Service is as follows:

- a) **The Royal Navy.** Instead of using direct supply, the Royal Navy have enabling contracts under which suppliers of hazardous materials deliver items to the three major Naval Bases in the United Kingdom (Portsmouth, Faslane, and Devonport), which then forward them to vessels operating off-shore and overseas. For these locations the enabling arrangements operate in a similar way to direct supply arrangements, although we suggest that it may be worth exploring the scope for direct supply arrangements for some Naval shore establishments.
- b) **The Royal Air Force.** The Royal Air Force currently have direct supply arrangements for the majority of their hazardous items. The closure of the storage facility at RAF Carlisle in 1994 led the Royal Air Force to review their use of direct supply. They concluded that they would save £5 million over 10 years by using such arrangements where appropriate, and utilising the Army's depots for the remaining items, rather than building a new hazardous stores facility.
- c) **The Army.** The Army have few direct supply arrangements for hazardous items. This reflects the special problems involved in providing direct supply to over 1,000 units, most of which are relatively small and many of them mobile. However, there are a number of Army units, such as maintenance depots and training centres that may be attractive to suppliers offering direct supply contracts because they are static and likely to be relatively large users of hazardous items. The Army are looking to extend the use of direct supply arrangements generally (paragraph 2.20).

**2.34** The Department are planning to take full advantage of technical advances, in particular electronic exchange of information, which should facilitate further use of direct supply and 'just in time' delivery.

## Key Points

### **2.35** Key points on the methods used to buy items:

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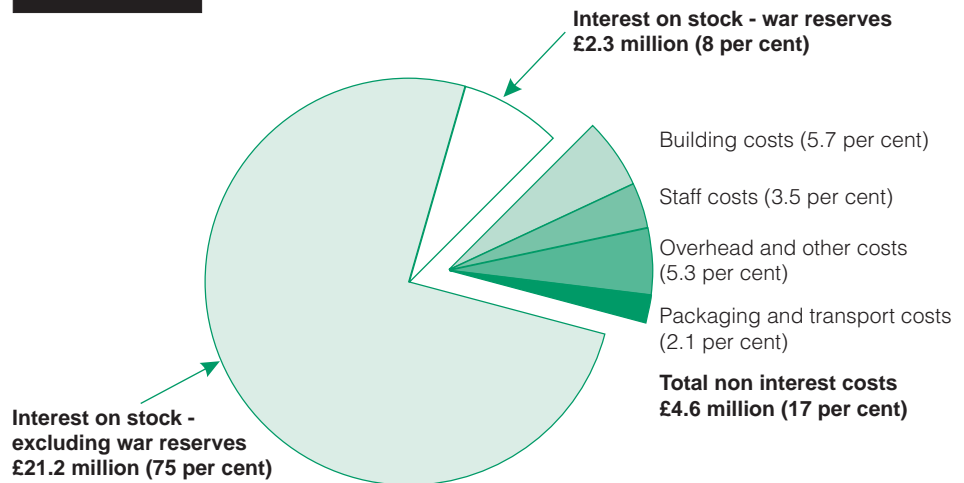
- a) Although most of their stock of hazardous items is bought under fixed quantity contracts, in recent years the Department have made use of enabling arrangements, transferring some of the inventory management risks to suppliers.
  - b) Our analysis suggests that if enabling arrangements could be extended to 10 per cent of low value items currently purchased on fixed quantity contracts, the Department may be able to make savings ranging from £1.6 million to £4.1 million by reducing their stock holdings.
  - c) The Department hold £36.5 million of stock which is at risk of passing its shelf life. For every £1 million of consumable items with a shelf life that the Department can in future transfer to enabling arrangements, the value of stock at risk of passing its shelf life may reduce by some £410,000.
  - d) Direct supply arrangements appear to offer savings of between £30,000 and £100,000 for every £1 million of items issued, but the financial and operational costs and benefits need to be assessed on a case by case basis. The Department are planning to take full advantage of technical advances to facilitate further use of direct supply.
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## Minimising the costs of holding hazardous items

**2.36** The Department hold some £374 million of hazardous items at their four main depots (Portsmouth, Bicester, Donnington and Stafford), including war reserves. Our analysis of the Department's data (Figure 11) suggests that the full cost of holding hazardous items at these depots is about £28 million (19 per cent of the value of annual issues), of which some £23 million is accounted for by interest on the capital tied up in stockholdings. This reflects the full value of items, although the hazardous component generally makes up a small part of the whole item.

**The full cost of holding hazardous items at the Department's main depots**

**Figure 11**



Note: Interest on capital reflects the full value of items, although the hazardous component may make up only a small part of the whole item.

This figure shows that of the total costs of £28 million for holding hazardous items, the cost of interest on stock holdings, including interest on war reserves, accounts for £23.5 million (83 per cent).

Source:  
National Audit Office analysis

**2.37** To minimise their stock holding costs, the Department need to decide what level of stock to hold at depots to ensure they can meet user demands. Figure 12 shows in simplified form how the Department decide when to re-order stock and how much. To assess how effectively the Department manage their stock of hazardous items, we examined:

- whether the Department are likely to use existing stock - by examining forecast stockturn and slow moving items; and
- key factors influencing the re-provisioning of stock - the lead time required for ordering items, levels of safety stock, and the optimum size of orders.

**Key data required for identifying when to restock and the quantity to be purchased, and for measuring how well stock levels are being minimised.**

**Figure 12**

Data requirements	Illustrative data
<p><b>Forecast demand</b></p> <p>The forecast usage of an item, calculated using data on historic patterns of usage.</p>	50 a month
<p><b>Current stockholdings</b></p> <p>The number of items in stock, less any already demanded by users.</p>	150
<p><b>War reserve requirements</b></p> <p>The number of items held to meet urgent operational requirements.</p>	50
<p><b>Lead time stock</b></p> <p>Stock to meet expected demand during the period between placement of an order and delivery by the supplier. Lead time stock is calculated by multiplying the lead time by the forecast demand. In this example, lead time is 1 month.</p>	50
<p><b>Safety stock</b></p> <p>Stock held, beyond holdings required to meet forecast demands, war reserve requirements and lead time, to allow for fluctuations in demand that may affect acceptable operational standards of service. In this example, safety stock is 1 month.</p>	50
<p><b>Net stock holdings</b></p> <p>Current stock holdings less war reserves and lead time stock. When this figure falls to zero, it is time to re-order the item.</p>	0
<p><b>Economic order quantity</b></p> <p>The optimum re-order quantity, taking into account the cost of ordering and holding items. The Economic Order Quantity is calculated using a standard statistical formula.</p>	100
<p><b>Maximum shelf life quantity</b></p> <p>For materials with a limited shelf life, the quantity purchased should be limited to ensure it does not deteriorate to an unusable state whilst in storage. This is calculated as the shelf life multiplied by forecast demand. In this example, shelf life is 6 months.</p>	300
<p><b>Recommended reorder quantity</b></p> <p>This is either the economic order quantity or the maximum shelf life quantity, whichever is the lower.</p>	100
<p><b>Stockturn</b></p> <p>The stockturn measures the speed with which items are being issued from store. It is calculated as current holdings divided by the number of issues (or by forecast demand, which would show the forecast stockturn)</p>	3 months

Source:  
National Audit Office analysis

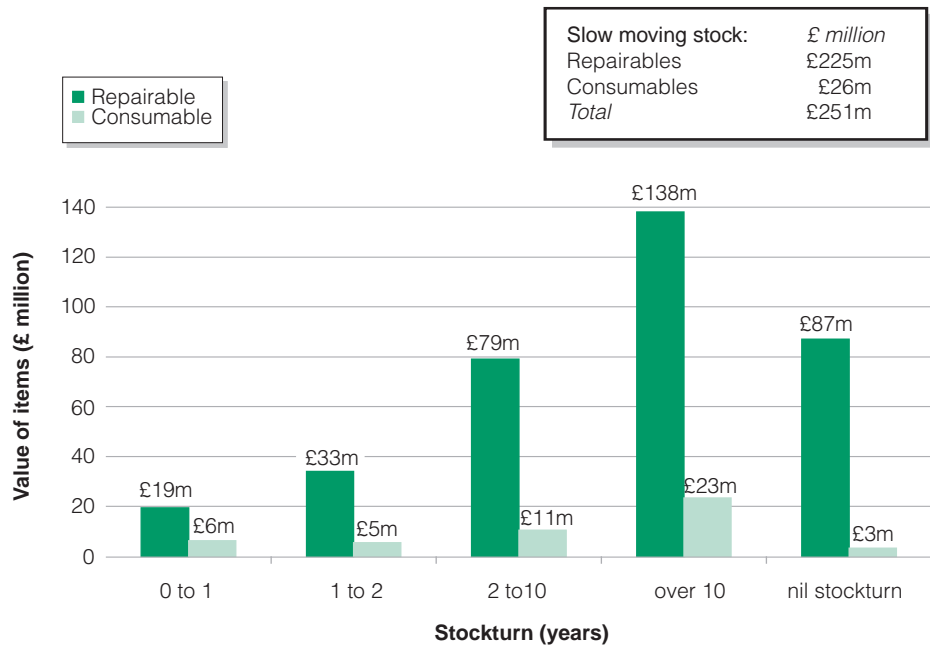
This figure shows a simple example of how a stock management system helps to decide when to re-order items and in what quantity.

### Forecast stockturn and slow moving items

**2.38** As mentioned in paragraph 2.22, stockturn measures the speed with which items are issued from store, and provides an indication of the demand. For the hazardous items held in the Department’s depots, repairables generally have a longer forecast stockturn (29 months) than consumables (14 months). Figure 13 shows that the Department held some £341million of stock where the stockturn is more than two years. Some £251million of stock had a stockturn of more than 10 years, including £90 million of stock where the Department were not forecasting any issues. These figures include items which the Department hold for operational contingencies and which could be used at a greater rate during operations. There are also £26 million of consumable items, which by definition would generally be used up more quickly than repairables.

Summary analysis  
of forecast stockturn  
for hazardous items  
held at the  
Department’s depots

**Figure 13**



This figure shows that across the Department’s depots, there are £251 million of hazardous items held with a stockturn greater than 10 years ( including non-moving items), of which £225 million were repairable and £26 million were consumable. This stock includes items held for operational contingencies which could be used at a greater rate during operations.

Source:  
National Audit Office analysis

**2.39** Some £170 million (68 per cent) of the stock with a forecast stockturn of more than 10 years was held at the Donnington depot, which holds mainly high value repairable items. Such items accounted for over 63 per cent of the stock at Donnington, with the top 20 (by value) accounting for £101 million - all classified as repairable items. We noted, however, that the Department did not review their slow moving items before deciding to proceed with the new £9 million hazardous stores building at Donnington.

**2.40** Slow moving and non-moving stock can indicate that holdings exceed those required. This could reflect a change of requirements since items were originally purchased, particularly for items bought in bulk to last the full expected life of the equipment to which they relate - in recent years the Department have been operating in a very different international environment, and equipment numbers have fallen, with a knock on effect on requirements for spare parts. The Department point out that it could also reflect the need to allow for long manufacturing lead times. Also, forecast stockturns may not present a complete picture of the likely usage of items, since they reflect historic demand and do not allow for changes in usage patterns, such as requirements for operational deployments, major training exercises or major equipment maintenance programmes.

**2.41** The Department review items where there have been no issues for 12 months and slow moving items are reviewed when considering whether to re-provision them. They recognise, however, that they hold significant quantities of slow moving stock and told us that as part of the Strategic Defence Review they are reviewing their procedures for identifying slow and non-moving stock suitable for disposal. This is consistent with the work done by other organisations to reduce their stock levels. For example, our report 'National Health Service Supplies in England' (HC 457, Session 1995-96) showed that the National Health Service had reduce their average stock from 77 days to 33 days over a period of some two and a half years.

**2.42** While the Department need to review slow moving items on a case by case basis to see if there is scope for realising sale proceeds, if by way of illustration, one per cent of the Department's £251 million slow moving stock could be turned into sale receipts, the proceeds would be some £2.5 million, less sales costs. However, the Department see limited scope for disposals and consider it likely that any sales would obtain only a fraction of the replacement value.

## Key Points

### **2.43** Key points on whether the Department are likely to use existing stock:

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- a) The average forecast stockturn (the time it will take to issue all current stock holdings) for the hazardous items held in the Department's main depots is 29 months for repairables and 14 months for consumables.
  - b) The Department hold £341 million stock of hazardous items with a forecast stockturn of more than two years. Some £251million stock has a stockturn of over 10 years, including £26 million of consumable items.
  - c) Over 63 per cent items at the Donnington depot have a forecast stockturn of more than 10 years. The Department did not review these items when deciding to build a new hazardous stores building at a cost of £9 million, and this calls into question the value for money being provided by the new store.
  - d) The Department review items where there have been no issues for 12 months and slow moving items are reviewed when considering whether to re-provision them. However, there appears to be further scope for the Department to review slow moving stock. If one per cent of the Department's items with a stockturn of over 10 years could be turned into sale receipts the proceeds would be some £2.5 million (less sales costs), though the Department see limited scope for receipts from disposals.
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### **Factors influencing the re-provisioning of stock**

**2.44** We looked at three key factors that influence the Department's decisions about when to buy items and in what quantity:

- the lead time required for ordering items;
- levels of safety stock; and
- the optimum size of orders.

**2.45** Under enabling arrangements, the Department usually buy items closer to the time they are required than they do with fixed quantity contracts, so enabling arrangements require more frequent re-provisioning decisions. We therefore concentrated mainly on items on enabling arrangements.



## The lead time required for ordering items

**2.46** The Department hold lead time stock to meet demands that may arise whilst they place orders (administration lead time) and await delivery from the supplier (delivery lead time). To make the most effective use of enabling arrangements lead times should be as short as possible, so allowing the Department to maintain lower stock levels. We analysed the lead times for some 130 items (Figure 14), and found that:

- a) The Royal Navy aim for an administrative lead time of no more than one month. The Royal Air Force have a target of two months. The Army do not have an equivalent target.
- b) The contractually specified delivery time averaged 1.9 months for the Royal Navy, 2.1 months for the Army and 2.8 months for the Royal Air Force.
- c) The actual lead time recorded by the Department averaged 4.3 months for the Royal Navy, 3.6 months for the Army and over a year for the Royal Air Force.

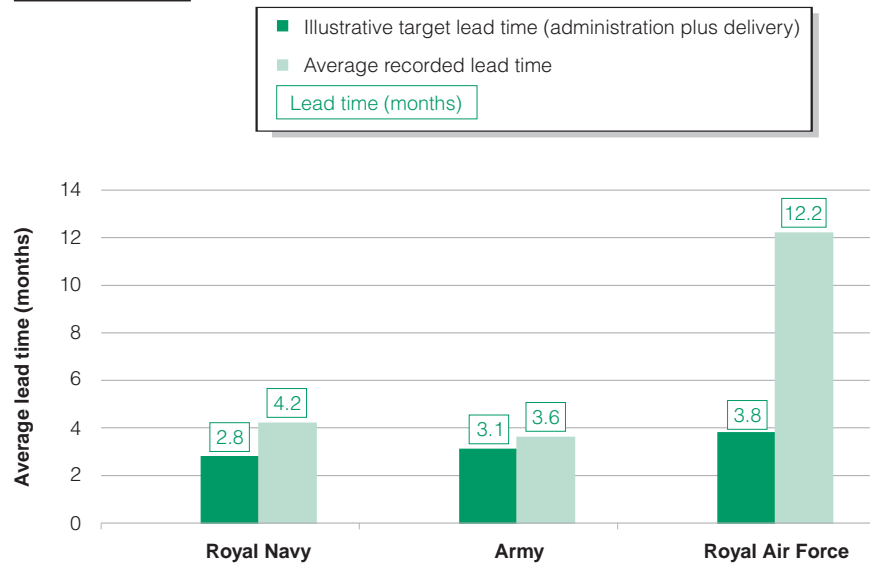
**2.47** Keeping lead times to a minimum depends on holding contractors to specified delivery times and operating tight administration times. For illustrative purposes we calculated target lead times using the Royal Navy's one month administration time and the contractually specified delivery times and compared this with the actual lead times. As shown in Figure 14, the actual lead times exceeded the illustrative target lead times - by 1.4 months (33 per cent) for the Royal Navy, by 0.5 months (16 per cent) for the Army, and by 8.4 months (69 per cent) for the Royal Air Force.

**2.48** We identified total lead time stocks worth £10.9 million - £8.7 million in the Royal Navy, £2 million in the Army and £0.2 million for the sample of items examined in the Royal Air Force (for the reason in paragraph 2.2 we were not able to identify all consumable items on enabling arrangements in the Royal Air Force). We estimate that if the three Services achieved the illustrative target lead times there would be savings of some £3.4 million (31 per cent) from reduced stockholdings and interest on capital.

**2.49** The potential value of exploring the scope for further reductions in lead times is illustrated by the fact that for the £10.9 million of lead time stock we analysed, the average recorded lead time was 18 weeks - each week of lead time stock therefore costs some £0.6 million.

A comparison between the average recorded lead times of hazardous items held by each Service and illustrative target lead times

**Figure 14**



Note: In this illustration the administration lead time for each Service is one month. In practice administration lead time is one month in the Royal Navy, the Royal Air Force currently allow two months and the Army do not have a target.

Source:  
National Audit Office analysis

This figure shows that the average lead times recorded by the Department by each Service exceed the illustrative target lead times.

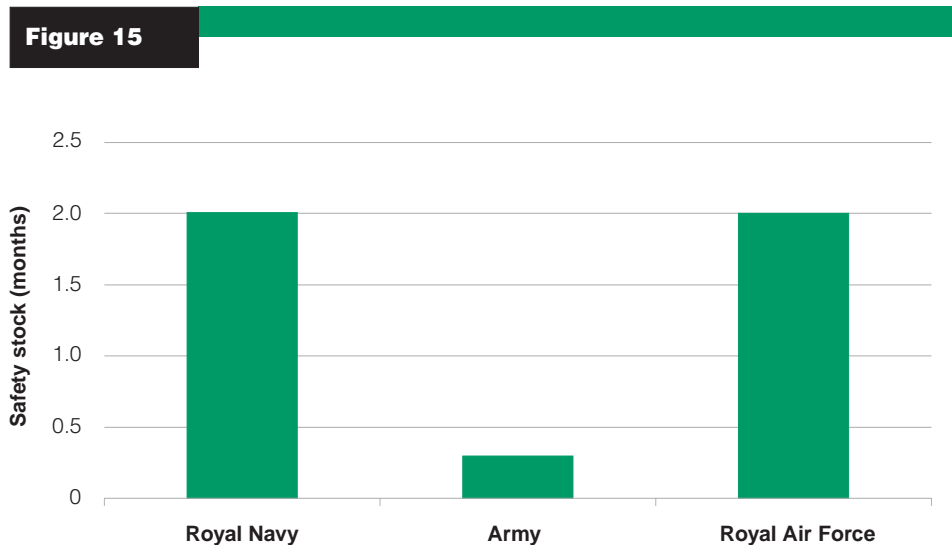
**2.50** We discussed with British Airways their management of lead times. They told us that they had established storage arrangements with one contractor to supply hazardous items and that they are able to obtain most of the items needed for routine overhaul of passenger jet aircraft within two days. Whilst British Airways operate in a different situation, the Department recognise the importance of establishing whether there are lessons to be learned from such arrangements.

### Level of safety stock

**2.51** Where historic usage levels fluctuate dramatically, 'safety stocks' are held to reduce the risk of items being out of stock if demanded. For repairable items, the Department may be able to meet their requirements for safety stock from items which users return to the depot. Our analysis of the Department's safety stock of hazardous items therefore focused on consumable items on enabling arrangements. We identified safety stock of £1.5 million, with the Royal Navy and the Royal Air Force holding on average some two months of safety stock, and the Army hold an average of 10 days (Figure 15).

**2.52** We noted that the differences between the Service’s safety stocks reflected their different approaches to assessing their requirements:

The average level of safety stock held by the Department for consumable items on enabling arrangements



Note: This information is derived from the Services stores computers. It excludes items held by the Royal Air Force as data on their procurement methods were not readily available. The figure shown for the Royal Air Force therefore reflects a sample of 30 items on enabling arrangements.

This figure shows the number of months of safety stock held by each Service for items bought under enabling arrangements. On average, the Army hold less safety stock (10 days) than the Royal Navy or the Royal Air Force (both 2 months).

Source:  
National Audit Office analysis

- a) While the Army limit safety stock to six months, they hold this maximum level for less than one per cent of their items and for 88 per cent of items they hold no safety stock.
- b) For the Royal Navy, the average safety stock is two months and they have more than six months safety stock for some 2,300 items.
- c) The Royal Air Force limit safety stock to three months and hold two months safety stock for most items.

**2.53** If the Royal Navy and the Royal Air Force were to adopt the Army’s practices for managing safety stock, we estimate that there would be savings of some £230,000 (26 per cent).

## Optimum size of orders

**2.54** When deciding on the size of orders, there is a balance between the costs of ordering (which are minimised by placing fewer orders for large quantities) and the costs of holding stock (which are minimised by placing frequent orders for small quantities).

**2.55** Our analysis suggests that for enabling arrangements, the Royal Air Force use economic order quantities about two times larger than those currently used by the Army and about six times larger than those currently used by the Royal Navy. This points to the need for the Department to do further work to identify the best balance between ordering and holding costs. The Department recognise this, and expect such an exercise to be facilitated by the introduction of resource accounting.

## Key Points

### **2.56** Key points on the reprovisioning of stock:

- 
- a) The Department are not making the most effective use of enabling arrangements to manage order lead times and are consequently holding more stock. We recommend the Department analyse fully why recorded lead times exceed the illustrative target lead times as there are potential savings of £3.4 million (31 per cent).
  - b) The Services adopt different approaches to assessing their requirements for safety stock. If the Army's approach to calculating safety stock were used more generally, there would be potential savings of £230,000 (26 per cent).
  - c) The Services use different methods for calculating order quantities. The Department recognise the need to do further work to identify optimal order quantities.
- 

## Measuring the performance of depots

**2.57** In examining the inventory as a whole much of our analysis of procurement methods and stock holding data has highlighted the scope for reducing stock levels. The following paragraphs therefore look at the performance of the Department's four main hazardous storage depots, focusing on three aspects where stores managers can more readily influence performance:

- meeting users' requirements;
- the costs of transactions;
- asset utilisation.

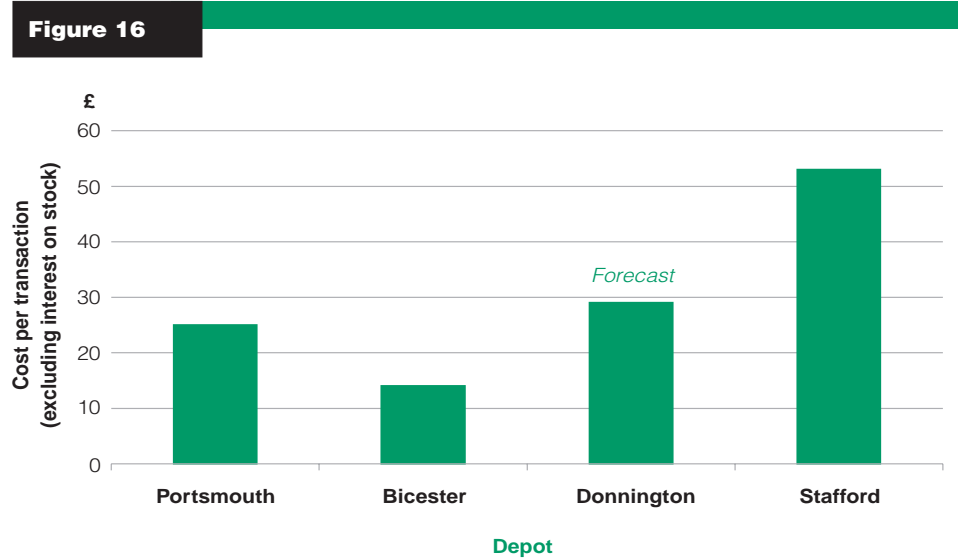
Whilst store managers are responsible for receiving, holding and issuing hazardous items, they do not decide how much stock should be held - this is done by inventory managers. We sought comparative information on the performance of the four main depots (Bicester, Donnington, Portsmouth and Stafford). Data were available for Bicester, which already has a dedicated hazardous stores facility, and forecast data were available for the new hazardous facility at Donnington. However, Portsmouth and Stafford do not have stores buildings dedicated exclusively to hazardous items, so performance data on some aspects of hazardous stores were not available.

**2.58 Meeting users' requirements.** The Department measure the speed of response to requests from users. They prioritise the issue of items according to the urgency of requests - for example, top priority items are to be despatched immediately and low priority items have to be despatched within seven working days. The Department's overall target is to issue 95 per cent of items (hazardous and non-hazardous) within these target times. Only at Bicester were there separate performance data for hazardous stores (reflecting the fact that it was the only depot with a dedicated facility), and the data showed that the depot had achieved their target times in the period we examined.

**2.59 The cost of transactions.** Figure 16 shows the average cost of each hazardous item transaction at the four depots, excluding the cost of interest on stock as stock levels are set by inventory managers not by local stores managers. There are difficulties in making comparisons between depots as performance will be influenced by a range of factors including the number of transactions processed, and the weight, bulk and value of items typically handled at the depot. For example, the average cost of a transaction at Bicester, which handles mostly low value fast moving consumable items, is some £14 whereas at Stafford, which holds more high value slow moving items, the average cost of a transaction is some £53. Performance will also be influenced by the design of the storage building. Donnington, for example, has a modern, purpose built, facility, and mechanical handling equipment is used to do many manual tasks. By contrast, at Portsmouth hazardous items are dispersed among a number of old storage buildings. Nevertheless, such comparisons can provide a starting point for the Department's further analysis.

**2.60** None of the four depots we visited set targets relating to transaction costs. And only one (Stafford) set targets for the number of transactions to be handled by each employee. So in addition to the transaction costs examined above, we suggest that two further measures should come into the Department's reckoning as they continue their work to strengthen their overall inventory management arrangements:

The cost of transactions of hazardous items at the Department's main depots



This figure shows the average cost of transactions for hazardous items at the Department's main depots. The costs exclude the cost of interest on stock, as stock levels are determined by inventory managers, not by the stores managers.

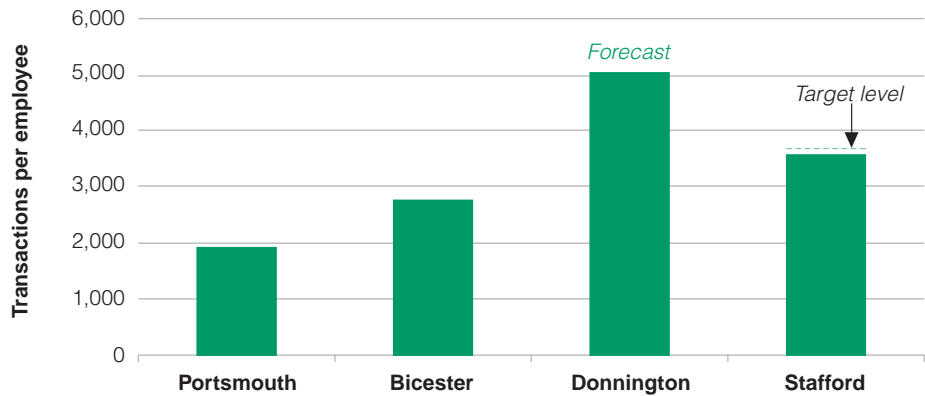
Source: Ministry of Defence

- a) The differences between the depots in the number of transactions handled by each employee. Figure 17 shows that the extremes are the Army's forecast of more than 5,000 transactions a year for each employee in their new building at Donnington (which will have mechanical handling equipment) and the fewer than 2,000 achieved at Portsmouth. In the purpose built facility at Bicester the number is 2,770. Stafford is the only depot to set a target for the number of transactions to be handled by each employee. This is done to allow managers to monitor the appropriateness of staffing levels. For the stores management groups at Stafford which include hazardous stores buildings, this target is set at 3,695 and in 1996-97 the depot achieved 3,580.
- b) The variations in the staff cost of each transaction. Figure 18 shows that at Bicester and Stafford the average staff cost of each transaction is some £4 and the Department forecast a similar figure for Donnington. At Portsmouth the equivalent figure is £9. We examined the average staff costs for each employee directly employed in the stores and found that there was little variation between the depots, thus reasons for variations in the staff cost of each transaction relate to the variations in output.

**2.61 Asset utilisation.** Information on the utilisation of storage facilities is an important measure for management, indicating whether depots can take on more stock if required. Spare capacity can also indicate possible opportunities for

**The annual number of transactions for each employee for the Department's buildings holding hazardous stores**

**Figure 17**



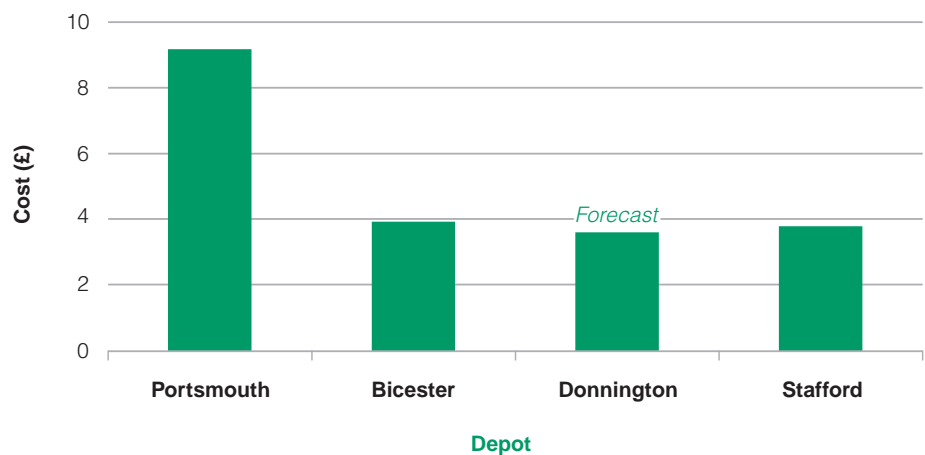
Note: Figures for Donnington are based on the Department's forecast level of activity for the new hazardous stores building. The figures for RAF Stafford show the overall performance of the management groups that include the hazardous stores buildings - the groups were some 3 per cent below their target.

This figure shows that in 1996-97 there were large variations between the Department's hazardous stores buildings in the number of transactions for each employee. Only RAF Stafford set targets.

Source:  
National Audit Office analysis

**Staff costs for each transaction at the buildings holding hazardous stores**

**Figure 18**



Note: Figures for Portsmouth, Bicester and Stafford are based on costs and transactions in 1996-97. Forecast cost and transactions are shown for the new hazardous stores at Donnington.

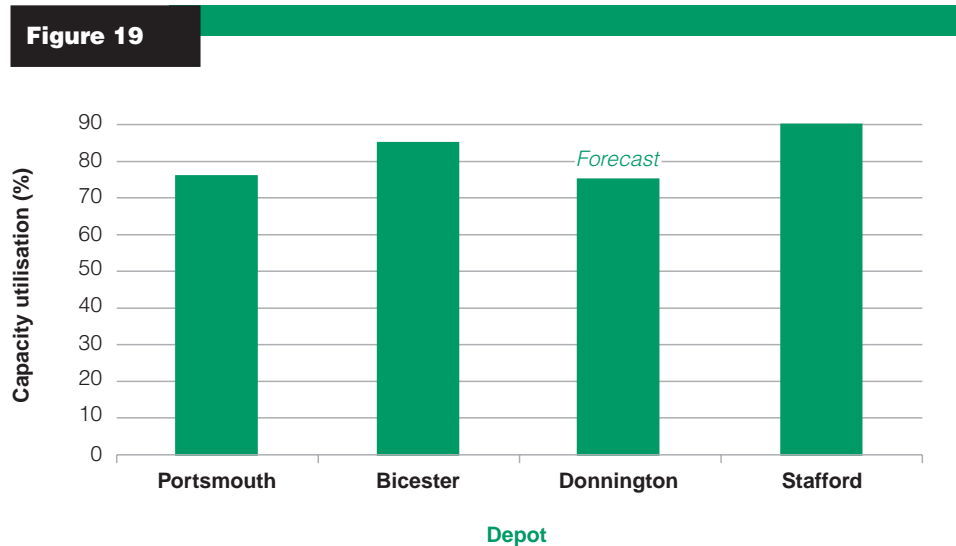
Source:  
National Audit Office analysis

This figure shows the differences in the staff cost of transactions at the Department's hazardous stores buildings.

rationalising the number of storage points for certain items. The Department have already reviewed their overall storage facilities as part of their Defence Cost Studies and have closed some 40 storage locations.

**2.62** Data provided by the Department on the levels of utilisation of the hazardous stores facilities at the four depots we visited, including the forecast utilisation for the new facilities at Donnington, suggest that between 75 per cent and 90 per cent of available capacity is, or will be, utilised (Figure 19). As hazardous items must, under health and safety requirements, be kept separately from most other types of item, it can be more difficult to utilise hazardous storage buildings. However, given the Army’s preliminary assessment that it may be possible to move some 75 per cent of their inventory onto enabling contracts or direct supply arrangements, the Department will, as they recognise, need to keep in view the extent of spare capacity.

**Capacity utilisation in the Department’s depot buildings holding hazardous stores**



This figure shows how much of the Department’s hazardous storage capacity is being utilised. For Donnington, the figure shows the level of capacity utilisation planned for the new hazardous stores building.

Source: Ministry of Defence



## **Overall management arrangements**

**2.63** As regards the overall management of the supply chain for hazardous items, there are many different players involved:

- a) At the initial procurement stage the Procurement Executive together with the equipment support authorities determine requirements and the procurement route.
- b) Stores managers are responsible for the issue of items from the depot - not the distribution and delivery of those items to end users.
- c) Equipment support authorities and Service provisioning authorities are responsible for minimising stock levels whilst maintaining continued availability of spares and supplies, although they are not accountable for the cost of holding stock.
- d) There is no central oversight of the full costs of items, and these costs are not identified and communicated to those responsible for the initial purchase, re-provisioning, storage distribution and use of hazardous items.

The Department's arrangements for managing hazardous items, which mirror those for other stores items, mean that responsibility for ensuring that the supply chain is managed efficiently and cost effectively is dispersed. The introduction of resource accounting in 1998-99 should improve the identification and communication of cost, and accountability, throughout the supply chain. The Department do not, however, have an overview of how well the system is currently performing. We suggest that this is something they should consider as they take forward their work to strengthen the management of their inventory as a whole.

## Key Points

### 2.64 Key points on measuring the performance of depots:

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- a) The Department have set targets for the speed with which items should be issued from depots but they have not developed a common set of targets to measure cost effectiveness.
  - b) The Department did not have data available for us to analyse the comparative performance of their four depots. However our preliminary analysis suggests that the Department should examine the reasons for apparent differences in cost effectiveness. For example:
    - The number of transactions for each staff employee at Portsmouth is less than 2,000 (compared with 2,770 for Bicester and 5,000 forecast for Donnington), and the staff cost for each transaction is more than double that of the other depots.
    - Given the Department's proposals to reduce stock levels, they will need to keep in view the extent of spare capacity in their hazardous stores facilities.
  - c) Responsibilities for the management of hazardous items are spread across the Department with no central oversight of the full costs of the supply system and there is no focus on overall performance. Resource accounting and budgeting should provide for better cost data and communication of costs, and end users will be held accountable for resources used.
- 

## Overall savings

**2.65** This Part identifies a number of ways in which the Department could make savings. It is difficult to assess the full potential for savings from general improvement in the management of hazardous stores, including performance monitoring. But many of the potential benefits flow from reduced stockholdings, and they fall into the following categories:

- a) **Reduced expenditure on new stock.** Where the Department are likely to have a continuing requirement but could manage with less stock, the process of running down stock by reducing expenditure on re-ordering would yield one-off savings.
- b) **Reduced risk of items passing their shelf life**, and thus avoiding re-lifing and disposal costs.

- c) **Disposal of surplus stock**, although the Department consider that there is little scope for selling their slow moving stock and that any sale proceeds would be low.
- d) **Removal of contract duplication**, to ensure that the Department minimise management effort in letting contracts and that stock is purchased at the lowest price.
- e) **Reduced holding costs**. With reduced stockholdings, the Department would save interest on capital (i.e. the amount of money tied up in stock). In time there might also be an impact on the Department's overall requirements for storage capacity.

**2.66** The box below summarises the specific areas where we estimate there is identifiable scope for savings and, where possible, gives illustrative figures.

<b>Illustrative savings from improved stock management of hazardous items</b>		
<b>Improvements in stock management</b>	<b>Illustrative savings</b>	<b>Paragraph reference</b>
<b>Reduced expenditure on new stock</b>		
Greater use of enabling arrangements to reduce stock held	£1.6 million to £4.1 million if 10 per cent of stock were purchased on enabling arrangements (Note 1)	2.23 and 2.24
Greater use of direct supply for items currently on enabling contracts	£30,000 to £100,000 for every £1 million of issues	2.31
Reductions in lead times	£3.4 million (Note 1)	2.48
Run down of safety stocks	£230,000 (Note 1)	2.53
<b>Reduced risk of items passing their shelf life</b>		
Greater use of enabling arrangements to minimising risks associated with shelf life items	£410,000 for every £1million of stock placed on enabling arrangements. However, some stock can be relifed	2.27
<b>Disposal of surplus stock</b>		
Revenue from sale of slow moving (stockturn over 10 years) and non-moving stock	£2.5 million for every 1 per cent of replacement value realised at sale, less selling costs. However, the Department consider that there is little scope for disposals	2.42

continued ...

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**Illustrative savings from improved stock management of hazardous items -  
*continued***

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<b>Improvements in stock management</b>	<b>Illustrative savings</b>	<b>Paragraph reference</b>
<b><i>Removal of contract duplication</i></b>		
Purchasing each item under a single contract	£50,000 a year if 10 per cent of possible duplicate items bought at the lower price	2.13
<b><i>Reduced holding costs</i></b>		
Reductions in stock holdings	Interest on capital- this is included in the illustrative savings from reduced expenditure on new stock	
Potential reduction of requirements for overall capacity	Future savings in total overhead cost	2.62

Note: 1. Savings through greater use of enabling contracts are for the Royal Navy and Army only. For reductions in lead times and safety stock, savings cover the Royal Navy, Army and a sample of items in the Royal Air Force. Data were not kept in a readily accessible format that would allow us to identify the full potential for savings for the Royal Air Force.

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## Part 3: Health, safety and environmental protection

**3.1** This Part considers the protection of people and the environment against the potentially harmful effects of hazardous items.

**3.2** The Department's responsibilities in relation to health, safety and the environment go much wider than hazardous items and cover all the Department's activities. This report seeks only to highlight the key issues relating specifically to hazardous items - that is, it does not seek to audit the Department's arrangements in their entirety, although it draws out some general points and shows how hazardous items fit into the wider context of health, safety and environmental protection in the Department. The relevant legislation, including the 'Environmental Protection Act 1990', the 'Control of Substances Hazardous to Health Regulations 1994' and Health and Safety Executive guidance (HS(G)65), formed the backdrop to the examination.

**3.3** We were assisted by AEA Technology, who provided advice on technical matters, including the provisions of the relevant legislation. In doing their work AEA Technology did not seek to audit in full the Department's compliance with every aspect of the relevant legislation - rather, their aim was to make a broad assessment of the protection measures at each location visited (page 8), and to identify any areas which might particularly merit the Department's attention. We also visited Shell Chemicals UK Ltd to provide a private sector perspective on health, safety and environmental protection issues, and the report draws on this in a number of places.

**3.4** In common with other organisations, the Department face an increasing challenge in meeting their obligations for health, safety and environmental protection. For example they have had to respond to an increased number of regulations under the Health and Safety at Work Act 1974 and the Environmental Protection Act 1990. Most health and safety and environmental legislation applies in full to the Department's activities in the United Kingdom. Where it does not apply, the Department's policy is to introduce internal standards which are, so far as is reasonably practicable, at least as good as those required by legislation. The Secretary of State for Defence has the authority to grant exemptions from many health and safety regulations in the interests of national security, but this power has not been exercised.

**3.5** Line managers throughout the Department are responsible for implementing appropriate health and safety arrangements and complying with legislation. To develop policy and provide guidance and expertise, the Department have established central Directorates for health and safety and environmental protection together with Service focal points. The Department operate a series of committees to co-ordinate their activities (Appendix 1). In September 1998 the Department intend to merge their central Directorates, and rationalise the committee structure to achieve a more integrated approach. We noted that Shell Chemicals UK Ltd operate an integrated health, safety and environmental protection management system.

**3.6** Against this background, this Part looks at the aspects set out below.

**The aspects examined by  
the National Audit Office**

- 
- The storage and use of hazardous items.
  - Distributing and disposing of hazardous material.
  - The Department's monitoring arrangements.
  - The scope for reducing the risks from hazardous items by reducing usage.
- 

## **The storage and use of hazardous materials**

**3.7** The four major depots we visited (Portsmouth, Bicester, Donnington and Stafford) hold some 80 per cent by value of the Department's depot inventory of hazardous items.

**3.8** **Portsmouth Naval Base** is the principal depot for the Royal Navy's hazardous general stores. The storage facilities consist of a number of buildings which have been adapted for storing hazardous material, with one building, the radiological store, purpose built. The Department are implementing a fire protection programme at the base, and in March 1998 they completed a survey of all major buildings, including those which hold hazardous items. The Department recognise that there are areas where they need to achieve improvements to be fully compliant with legislation. During our visits we found that:

- a) Facilities in the battery shed were out-dated and posed serious risks as set out in the following box. The Department confirmed that they have now completed the refurbishment of the facility to bring it up to the standard required.

- b) The corrosive chemical store was congested and poorly arranged, and as a result access to the emergency spillage equipment was restricted. The Department confirmed that they have now reorganised the store to provide access to the emergency spillage equipment.

**The Battery Storage  
facility at Portsmouth  
Naval Base**

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The Department's facilities for depot storage of ship batteries were not fully compliant with current legislation and these presented a number of risks:

- The charging equipment had exposed throw switches, which were not of a flameproof standard.
- There was no Local Exhaust Ventilation to remove Hydrogen in the charging room.
- There were exposed elements on the electrical discharge equipment used to remove residual charge from batteries prior to any maintenance work being carried out.
- The sump for emptying waste electrolyte could overflow into the adjacent dock. While the electrolyte is neutralised the sump and electrolyte have a very high lead content.
- The manifold for topping up batteries with sulphuric acid was located above the sump. A leak in the pipework could lead to acid draining into the adjacent dock.

The Department recognised that this facility did not meet the required standards. They confirmed that they have now removed most of the old charging equipment, and refurbished the facility.

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**3.9 Bicester and Donnington** are the Army's principal depots, and they have taken action to provide special facilities for hazardous items. They built a fire protected facility at Bicester in 1989 at a cost of £5.5 million, to hold hazardous consumable items. At Donnington, hazardous items have been dispersed across several old buildings, two of which remain to be fire protected as part of the Donnington fire protection programme, which is due to be completed by 2002. A purpose built facility for hazardous repairable items was completed in January 1998, at a cost of £9 million. The two buildings at Bicester and Donnington will house most of the Army's hazardous items, and Donnington will also hold tri-Service items following rationalisation of the Services' inventories.



The interior of the facility for storage of hazardous items at Bicester, and some of the mechanical handling equipment used to move items around the building.



Oxygen cylinders being removed from the shelf at the new storage facility for hazardous items at Donnington, using modern mechanical handling equipment.

**3.10** **RAF Stafford** is the Royal Air Force's principal depot for hazardous stores. The Department have been implementing a fire protection programme since 1986, and added further buildings to the programme in 1990. At the time of our visit the facilities at Stafford, whilst in general not purpose built, were broadly compliant with legislation relevant to the storage of hazardous materials.

**3.11** The hazardous storage facilities at the seven **end-user establishments** we visited had either been constructed for the purpose of storing hazardous materials, or had been modified to meet statutory requirements. There were, however, two establishments where current facilities posed risks:

- a) At RAF Wittering some 100 drums containing hazardous material were stored in an outdoor compound with no spillage protection, the risk being that material leaking from the drums could enter the drainage system.
- b) At Wattisham Army Airstation the Department recognised that the hazardous store attached to a new maintenance and storage facility was not constructed in line with health, safety and environmental regulations as spillage containment



and ventilation were not adequate, and the store's wooden roof presented a fire risk. The Department have carried out some remedial work to improve spillage retention and ventilation.

**3.12** At the depots and end-user sites visited, the Department had taken appropriate measures to protect personnel in that there were restricted areas, barriers and signage, and personnel were issued with protective equipment.

## Key Point

### **3.13** Key point on the storage and use of hazardous material:

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The Department have invested in purpose built facilities at Bicester and Donnington, and in most other cases have upgraded facilities to the minimum level required to comply with legislation. However, there were instances of non-compliance where the Department's practices posed risks, most significantly the battery store at Portsmouth depot, and two storage facilities at end user establishments posed risks. The Department have confirmed that they have now addressed these risks.

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## Distributing and disposing of hazardous material

**3.14** All hazardous materials sent to users, and to third parties outside the Department, such as contractors, or purchasers of surplus material, require accompanying paperwork - a Safety Data Sheet and, if the material is considered dangerous for carriage, a Transport Emergency Card. From our examination of the Department's arrangements for managing the distribution of hazardous material we noted that:

- a) Having recognised that their system for providing Safety Data Sheets (required by the recipients of all hazardous material) needed improvement, the Department recently introduced a replacement system - the Hazardous Stores Information System - which distributes information quarterly on compact discs.
- b) At the depots we visited hazardous items were being despatched to users with Transport Emergency Cards, which provided the information required.
- c) The Department had been faced with a backlog of drivers requiring training to comply with 'the Carriage of Dangerous Goods by Road (Driver Training) Regulations 1996'. They confirmed that the backlog has now been cleared.
- d) Appropriate packaging is required for hazardous materials enabling them to be transported in unmodified vehicles. Our consultants, AEA Technology, noted during their visits to the Department's four major depots that the packaging

materials and techniques used met the requirements of road, rail, sea and air transport regulations. The seven end-user sites we visited were also using the same standard of packaging when sending material to units on deployment.



**3.15** As regards the arrangements for the disposals of hazardous waste, five of the sites we visited had constructed hazardous

Hazardous items being packaged and labelled in the facility for storage of hazardous items at Bicester.

waste compounds in recent years, at a cost of around £160,000 each. In July 1997 there was a small fire in the hazardous waste compound at Wattisham Army Airstation, but an oil interceptor trapped the effluent. At the remaining six sites there are risks of any spillages not being contained and of waste streams not being separated. At the Donnington depot the facility for storage of material prior to disposal has not been upgraded to flameproof standard. The Department confirmed that these materials will be stored in the recently completed purpose built hazardous stores building at Donnington.

**3.16** All of the 11 sites we visited had arranged for hazardous waste and surplus materials to be collected for disposal by a licenced waste contractor. The contractors dispose of non-radioactive hazardous waste by incineration or landfill at special facilities licensed for this purpose. The Department's low level radioactive waste is sent to British Nuclear Fuels Limited at Drigg. The Government are signatories to the International Convention for the Prevention of Pollution from Ships 1973, and associated regulations. The Department confirmed that they have not disposed of any hazardous waste at sea since 1992 when the regulations came into effect.

**3.17** For some materials the Department have had difficulty identifying appropriate methods of disposal, so there has been a build-up of hazardous waste:

- a) The Department, in common with other users nationally, were unable to identify an appropriate disposal route for 'Beta-Lights', small luminescent objects used as a light source in a number of pieces of equipment. Beta-Lights contain Tritium, but they have to be broken up to release the Tritium gas, and this must be done in a sealed facility to prevent the gas escaping into the environment. The Department have now identified contractors who are able to dispose of such items, and they expect to let a contract by the end of 1998.



A number of Beta-lights (luminescent objects used as light sources), and a five pence piece to show the scale. Beta-lights are manufactured in several shapes and sizes.

- b) The Department are incurring storage costs of £41,000 a year at Donnington for obsolete items containing low level sources of radiation. Such items used to be disposed of through a handling facility at RAF Carlisle before that site was closed in 1995, and the Department are establishing a small facility at RAF Stafford to take on this task.

**3.18** Under the Environmental Protection Act 1990 the Department are responsible for ensuring that third parties who receive hazardous items and waste material have full information, and that they select third parties who comply with the Act. The Department provide the required paperwork, and select approved waste contractors (paragraphs 3.15 and 3.16). The Department's policy is that there should be periodic inspections of contractors' sites to provide assurance that third parties are complying with legislation. The Department do not maintain any central record of such inspections and the establishments we visited relied on paper-based checks of contractors' licences to obtain assurance that they comply with legislation.

## Key Points

### **3.19** Key points on distributing and disposing of hazardous material:

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- a) Most establishments visited have taken the necessary steps to distribute hazardous items and to store and dispose of waste in a safe manner using licensed contractors.
  - b) For some materials the Department have not had an appropriate method of disposal, so there has been a build-up of hazardous waste.
  - c) The Department should look to gain greater assurance that third parties contracted to dispose of waste are complying with environmental legislation through inspections and by maintaining central records.
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## The Department's monitoring arrangements

**3.20** **Health and safety.** Best practice guidance issued by the Health and Safety Executive points to the need for programmed reviews of performance based on monitoring of activities and independent audits, and recommends the publication of overall performance in annual reports. The Health and Safety Executive, as the statutory regulatory authority, undertake independent audits of the Department's establishments. As regards the Department's own monitoring arrangement:

- a) All 11 establishments we visited had designated staff with responsibilities for undertaking health and safety inspections and providing advice on health and safety issues. At eight of the establishments, health and safety staff were full time civilians who were qualified and had gained considerable experience in health and safety issues. At the other three establishments health and safety was the part time responsibility of a serving military officer based at the establishment. Each establishment had in place a programme of health and safety inspections which covered the storage and use of hazardous materials as part of their inspection of all activities at the establishment.
- b) In addition to the inspections carried out at establishments, the Department's central Directorate of Health and Safety conduct audits to provide assurance to senior management on compliance with legislation and Departmental standards. The Directorate have developed a set of common and quantifiable performance indicators which will be introduced progressively across the Department from 1998 to provide a mechanism for measuring and comparing establishments' performance. During 1996-97 and 1997-98, the central Directorate carried out 15 audits of Army establishments, one audit each year of a Royal Navy establishment and no audits of Royal Air Force establishments.

- c) The Royal Navy and the Royal Air Force health and safety specialists carry out their own audits, and are introducing the Quality Safety Audit methodology developed by the Royal Society for the Prevention of Accidents. The Army health and safety specialists also carry out audits adopting the same approach as the central Directorate of Health and Safety.

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### Quality Safety Audit

The Royal Navy and Royal Air Force are adopting the Quality Safety Audit methodology developed by the Royal Society for the Prevention of Accidents. This provides for a quantitative measure of health and safety performance, allowing establishments to benchmark their performance. There are 12 audit areas covering the core elements of Health and Safety Executive guidance HS(G)65: Policy, Organising, Planning and Implementation, Measuring Performance, and Audit and Performance Review. The audit results are expressed on a scale of 1-5, corresponding to the minimum score achieved in all 12 sub-sections of the audit:

Level	minimum score (per cent)
1	30
2	45
3	60
4	70
5	80

Two of the Department's establishments have had a Quality Safety Audit conducted or verified by external health and safety auditors, the Royal Naval Stores Depot at Colerne - which achieved a level two, and RAF St Athan - which achieved a level three. The Royal Society for the Prevention of Accidents confirm that as at June 1998, only ten organisations in the United Kingdom have achieved a level three or higher.

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- d) There is a risk that the different approaches used by the central Directorate and the Service specialists may result in different standards being applied across the Department, reducing the scope for direct comparisons of performance. We noted that Shell Chemicals UK Ltd adopt a standard approach for all their audit work. The Department have recognised the need for consistency, and they are working to develop a common audit method which will address both health and safety and environmental management.
- e) Line managers at the establishments we visited were undertaking risk assessments of activities annually, and when there were significant changes to the way jobs are carried out. Risk assessments help focus management attention on those activities which would have the most serious consequences should an accident occur. We noted that Shell Chemicals UK Ltd have developed a risk assessment matrix to examine the impact of potential incidents on people, the environment, company assets and the company's reputation, and this allows them to focus attention on the most significant risks. The

Department are developing similar risk assessment strategies in some areas, but there is scope for extending such approaches. The merging of the health and safety and environmental protection directorates should help here.

- f) Health and safety guidance calls for the thorough investigation of accidents and ill health, and the Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations 1995 require the Department to monitor accidents. Accidents involving hazardous materials are not a separate category - for example accidents in hazardous storage depots may be caused when incorrectly lifting crates where the hazardous nature of items is incidental. In 1997 the Department introduced a new accident reporting system to help them evaluate the impact of accidents to all personnel, Service and civilians. The system is designed to provide more information than that required for compliance with the 1995 Regulations.
- g) The Department prepare annual reports for internal use to provide information to senior management on problems and developments in health and safety. They also cover health and safety issues in their annual Statement on the Defence Estimates. The Health and Safety Executive recommend publishing an annual report on health and safety, and we noted that Shell Chemical UK Ltd publish an annual report on their health and safety performance.

**3.21 Environmental protection.** The Department's policy is to conduct their activities in line with the Government's overall environment policy set out in the 1990 White Paper 'This Common Inheritance'. The Department have issued an environmental manual, and at each of the 11 establishments we visited there were designated staff with responsibility for providing advice on environmental issues, liaising with Environment Agency staff and local authority inspectors, and carrying out environmental protection monitoring. As with health and safety personnel, the environmental staff were a mix of civilian and Service officers.

**3.22** Although none of the sites visited was carrying out a programme of environmental inspections, they were carrying out monitoring activities. The monitoring activities tended to be reactive as opposed to a programmed approach of cyclical audits based on analysis of risk but included: tracing drainage outfalls; monitoring potential soil contamination in high risk areas and locating any sites of historic contamination; and cataloguing the use of materials which could harm the environment if they were mishandled. The value of a robust approach to environmental protection monitoring was shown by the results of the Department's monitoring at RAF St Athan.

**Environmental  
monitoring at  
RAF St Athan**

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***Paint shop ventilation causes problems***

Ventilation systems installed in paint shops at RAF St Athan work well, and personnel inside the buildings are protected from fume inhalation. However, the Department identified that the current chimneys were not adequate, and that the concentration of fumes outside the buildings was too high. Work is now being done to bring the chimneys in line with the Environmental Protection (Proscribed Processes and Substances) Regulations 1991 - at a cost of £181,000.

***Wash water treatment***

RAF St Athan wash aircraft as part of the maintenance programme. Initial plans for a new wash pan included facilities for removing oils from the wash water, but the Department's analysis of the wash water from Jaguar aircraft revealed high levels of Cadmium - some 150 times their accepted discharge level. The Department have installed additional water treatment equipment on the wash pan bringing the total construction cost to £183,000, with the aim of reducing the levels of Cadmium to acceptable levels.

A Tornado being washed at RAF St Athan during a major service. The wash water is collected in the wash pan and treated to reduce the heavy metal content to acceptable levels.



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**3.23** The Department plan to introduce an environmental management system which, with a system of risk assessment to prioritise attention on those areas of greatest risk, will provide the basis for environmental audits. The Royal Air Force are developing an Environmental Management System based on ISO 14001 for implementation in 1998. In preparation for this by March 1998 they had completed more than 50 compliance audits against environmental legislation. From a review of the documentation our consultants, AEA Technology, considered that the Royal Air Force's Environmental Management System compared well with other organisations, met appropriate requirements, and demonstrated a high level of commitment to develop a thorough and detailed system. The Royal Navy are also developing an Environmental Management System drawing on the Royal Air Force's. The Army have an Environmental Management System covering their training areas.

## Key Points

### **3.24** Key points on the Department's monitoring arrangements:

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- a) The Department have arrangements in place for undertaking health and safety audits - either by the central Directorate or the Services - and inspections by the designated staff at individual establishments. However, in 1996-97 and 1997-98 the central Directorate did not carry out any audits in the Royal Air Force, and only one audit each year in the Royal Navy. The Health and Safety Executive also audit the Department's establishments.
- b) The Department are introducing improved health and safety audit methods. However, there is a risk that the adoption of different methods could reduce the scope for comparing performance across the Department.
- c) There is scope for extending the use of risk assessments to focus management effort on areas of highest risk.
- d) The Department are establishing an environmental management system which will provide the basis for environmental audits. None of the establishments visited was undertaking a programme of environmental inspections. They were, however, carrying out environmental protection monitoring.

## The scope for reducing the risks from hazardous items by reducing usage

**3.25** The most direct way of reducing the potential risks of using hazardous items is to reduce the need to use them at all (paragraph 2.9), and to exercise control over their use once in service. We looked at whether there are lessons to be learned from experiences in the United States, recognising that differences of scale make comparisons with the Department difficult. The United States Department of Defense have introduced the 'Consolidated Hazardous Material Re-Utilization and Inventory Management Program', which aims to reduce the volume of hazardous material in use and improve the control of material once it has been issued to users. As part of this programme they have introduced a Hazardous Items Control System, and the United States Navy estimate that using this system has enabled them to reduce the volume of hazardous materials they use, with gross savings of some \$133 million over five years.



**The United States Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP)**

The United States Department of Defense introduced the CHRIMP programme to meet their obligations under United States environmental law. The programme aims to introduce 'Total Quality Management' for all hazardous material procured and used by the Department of Defense, with controls put in place to reduce the amount of hazardous material used, and the amount of hazardous waste generated. The programme includes the Hazardous Item Control System with the following features:

- identifying a single point control of hazardous material at the end-user site;
- restricting use to authorised users on site;
- controlling issues by demanding empty and part used containers before issuing a replacement.

The CHRIMP methodology also encourages extensive use of recycling to offset the administrative cost of the programme.

**3.26** We visited the United States Air Force stationed at RAF Mildenhall to look at their experience of using the Hazardous Item Control System. The system had been fully operational for almost two years and Figure 20 shows that after the first year there had been reductions in overall quantities of hazardous materials in the work place and in stock. Additional resources were required to achieve this.

**Results of the Hazardous Item Control System at the United States Air Force RAF Mildenhall**

**Figure 20**

<i>Category</i>	<i>Achievement</i>
Reduce hazardous material in work areas	63%
Reduce hazardous material in stock each year	3%
Reduce range of hazardous material stocked	baseline of 1300 items set
Maintain stock availability	83%
Reduce the amount of hazardous waste generated	61%
Reduce EPA-17 <sup>1</sup> chemical consumption by end of 1996	10% estimated annual reduction

- Notes: 1. The EPA-17 is a list of chemicals whose use is restricted by the United States Environmental Protection Agency.
2. Cost data for the Hazardous Item Control System at RAF Mildenhall were not readily available.

Source: United States Air Force, RAF Mildenhall

Figure 20 shows the reductions in hazardous materials achieved by the United States Air Force stationed at RAF Mildenhall using the Hazardous Item Control System

**3.27** The Royal Air Force have examined developments in the United States and concluded that the smaller scale of operations here, and the need for additional resources, prevented the full adoption of similar initiatives in the United Kingdom. They have, however, conducted a limited trial which produced a reduction in the volume of material used, better stock management, and greater use of correct disposal routes (Figure 21), but indicated that additional resources would be required to introduce the system across the Royal Air Force. We visited RAF Marham, one of the trial sites, which continues to use a simplified system. Users and supply personnel at RAF Marham said that they were satisfied that the benefits of reduced usage and improved control outweighed the minor inconvenience, and that given the simplified system, they had been able to achieve this without an increase in personnel.

**Results of the  
Department's trial of the  
Hazardous Item Control  
System**

**Figure 21**

**Aim**

To Reduce the consumption of hazardous items

To encourage the complete use of products and reduce the number of items disposed of part-used

To provide an audit trail that ensures that all empty containers are disposed of legally

**Achievement**

Holdings of hazardous material in the workplace were reduced by up to 62%

20% of returned items at one site were full or part-used

The volume of material returned for disposal increased some 34% at one site

Figure 21 shows the results of the Department's trial of the Hazardous Item Control System. While there has been a fall in the level of hazardous materials stored in the workplace, disposals volumes have increased, and the Department recognise that previously they were not properly disposing of waste materials and containers.

Source: Ministry of Defence

**3.28** While hazard minimisation can be achieved through good housekeeping, as at RAF Marham, other solutions can require significant investment. For example the Department have traditionally used solvents for paint stripping. At RAF St Athan the Department have invested £2 million in a new facility which uses plastic media stripping. While trials are not complete, the Department consider that they may well recoup the investment within three years, and are looking to extend the use of plastic media stripping at other establishments.

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### Plastic media stripping

RAF St Athan have recently constructed a complete airframe plastic media stripping facility. Previously, all airframes were stripped using chemical paint strippers. This was a time consuming process, and because of the chemicals used, there were significant health and safety risks. The plastic media stripping process removes paint with a stream of pressurised air and small particles - the plastic media.



The new facility cost some £2 million, and following initial trials the facility is now working full time. Stripping times have been reduced by some 30 per cent. While chemical paint stripping used 200 litres of a phenolic solvent each week, there are now no chemicals used in the process.



A Harrier being stripped using plastic media. All openings and areas susceptible to damage are covered to prevent the plastic media penetrating the fuselage and damaging the aircraft.

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**3.29** In substituting one material for another there can be difficult choices, with a tension between risks to the environment, and health and safety risks to the individual. As part of the requirement to eliminate Ozone-depleting chemicals, RAF Wittering identified a replacement which is highly flammable. The Department assessed the risks posed by the replacement chemical, and concluded that improved fume extracting equipment would reduce the risk to an acceptable level.

### Ozone-friendly replacement can still be hazardous

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The Early Failure Detection Centre at RAF Wittering examines oil samples from aircraft engines for the early signs of wear, to reduce the chance of engines failing during flight. The Centre used a solvent which is chemically stable and poses few health and safety risks, but which is Ozone-depleting. They identified an alternative, Ozone-friendly, solvent, but this is highly flammable. Before the new solvent could be introduced, the Centre required upgraded fume extracting equipment to minimise the health and safety risk of handling flammable solvents.

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## Key Points

### **3.30** Key points on the scope for reducing the risks from hazardous items by reducing usage:

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- a) The Department have conducted trials based on United States practice for minimising hazardous items in use, but they concluded that additional resources would be required to implement these systems across the Department. However, they have found that simplified systems have provided useful benefits, and they have invested in some facilities to eliminate the use of hazardous items.
  - b) The choice of materials can be difficult - for example, what is good for the environment may not be good in health and safety terms. In such cases the Department have undertaken appropriate risk assessments.
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# Appendix 1

## The Department's health, safety and environmental protection organisation

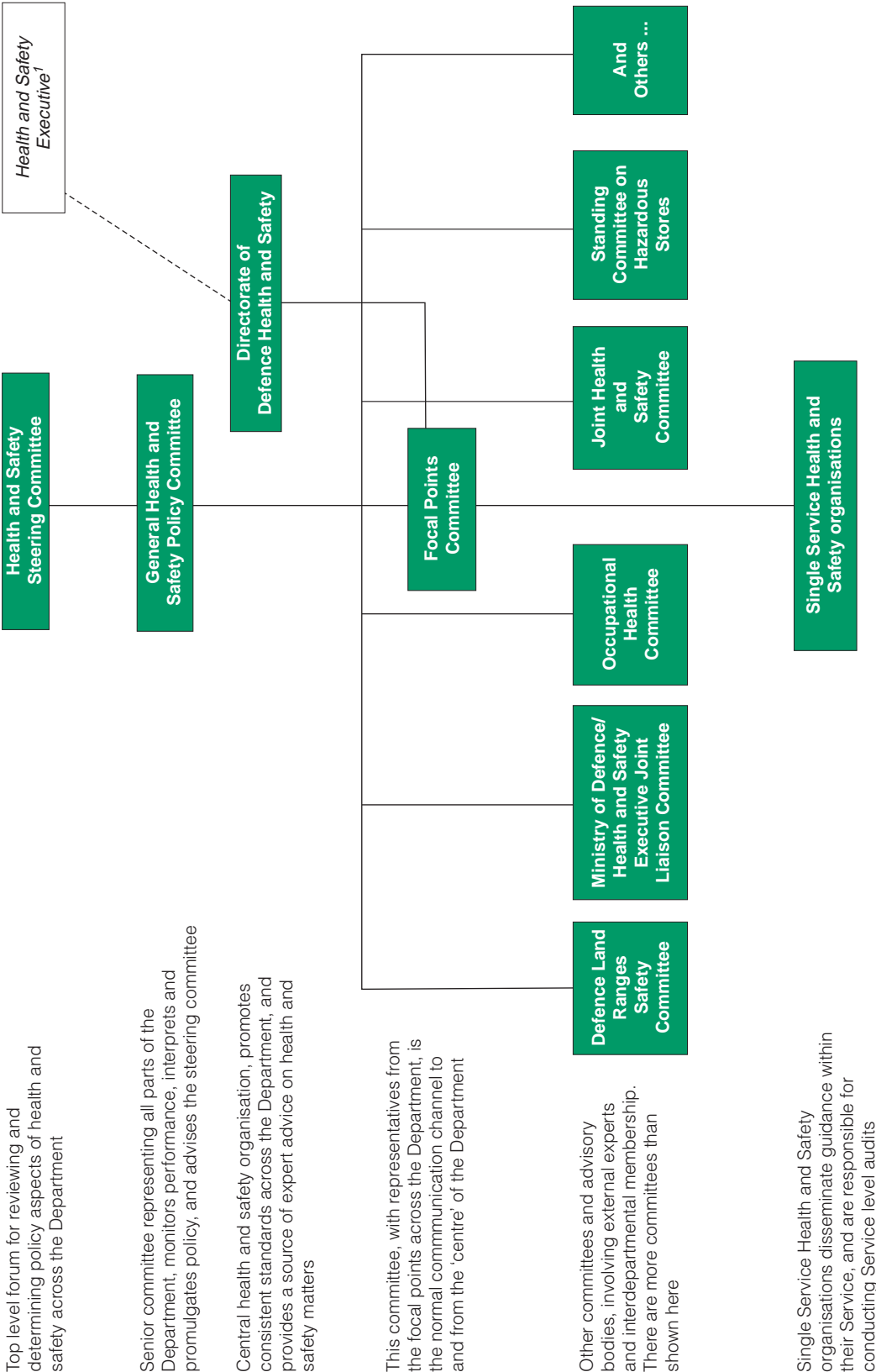
**1** The Department operate two committee structures for overseeing health and safety and environmental protection policies (Figures 22 and 23), which include representatives from across the Department at senior level. The committees are supported by the Directorates of Defence Health and Safety and Environmental Policy, and a system of 'Focal Points' - who provide centres of expertise for health and safety and environmental protection activity for the three Services and the Department's civilian organisation. In September 1998 the Department plan to merge the health and safety and environmental protection directorates and rationalise the committee structure.

**2** The Department issue guidance using five principal mechanisms:

- a) Joint Service Publications give guidance on all aspects of health and safety and on environmental protection, and are updated regularly.
- b) Defence Council Instructions give specific advice on emerging issues and legislation, which are in time incorporated into the Joint Service Publications.
- c) Single Service publications give guidance similar to Joint Service Publications but with particular emphasis on the Service concerned, and are also updated regularly.
- d) Instructions issued locally by units and establishments give more detailed information on topics covered in Joint and Single Service Publications.
- e) The network of focal points provide expert guidance, and assist in the dissemination of information.

**Figure 22**

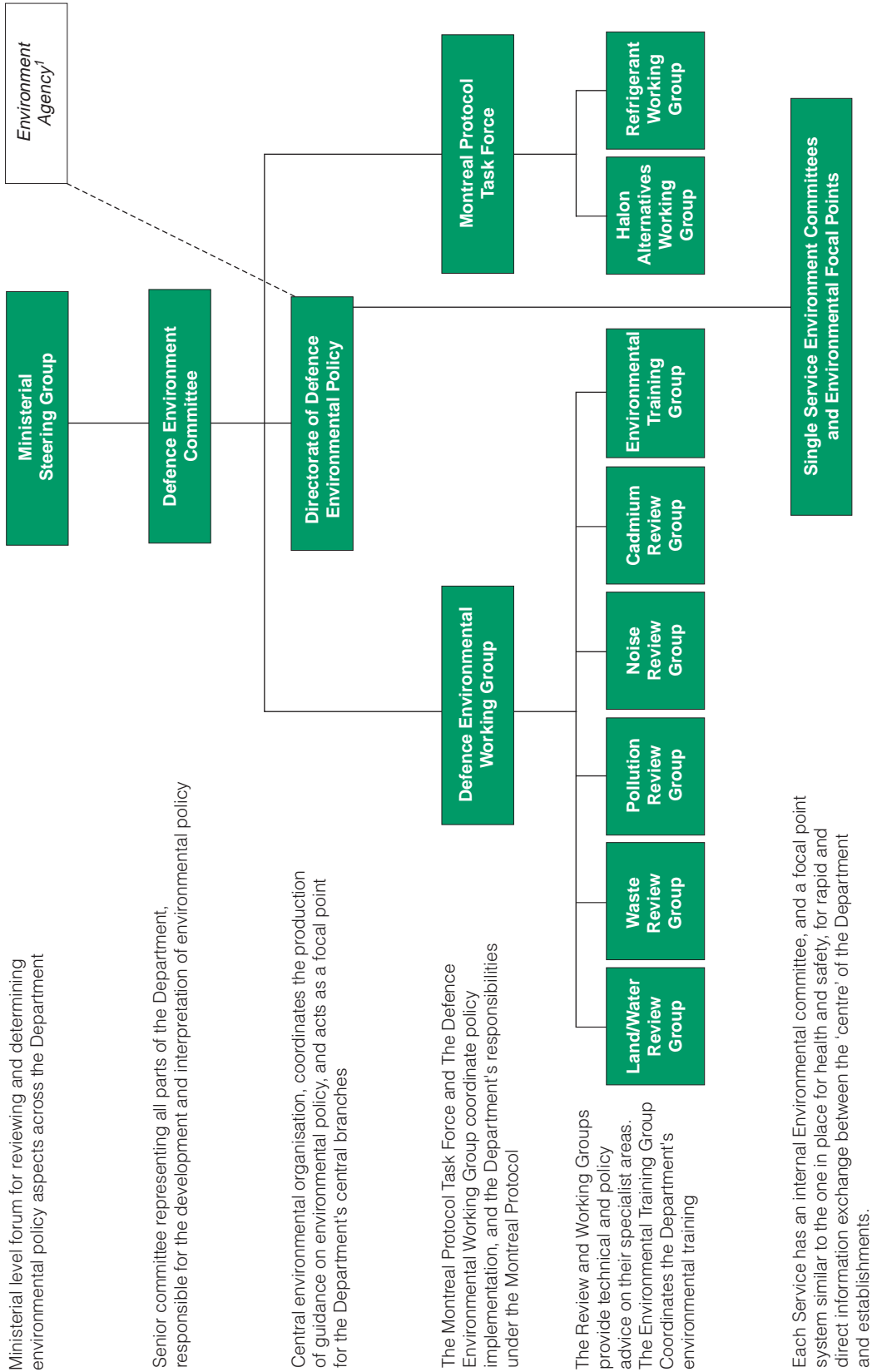
**The Department's Health and Safety committee structure**



Note 1: The Health and Safety Executive promote best practice health and safety management practices, and are responsible for enforcing the Health and Safety at Work Act 1974.

**Figure 23**

**The Department's Environmental Policy committee structure**



Note 1: The Environmental Agency promote best practice environmental protection measures, and are responsible for enforcing the Environmental Protection Act 1990.

## Appendix 2

### Audit Criteria used by the National Audit Office

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#### Part 2: Reducing the costs of using hazardous items

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	<i>National Audit Office best practice criteria</i>
a) Determining requirements for hazardous items	<p>Hazardous items are used only where there is a defined need. Non-hazardous, or less hazardous, alternatives are used if practicable and cost-effective.</p> <p>The Department have full oversight of possible alternative products already on the inventory.</p>
b) Methods used to buy hazardous items	<p>The choice of procurement method is based on analysis of the costs of all options. Stocks are held only where it is cheaper than alternative means of supply.</p>
c) Minimising the cost of holding hazardous items	<p>Stocks are held only where there would otherwise be unacceptable operational risk. Stocks are reviewed to identify non-moving and slow moving items.</p> <p>Stock controls are used, for example re-order levels take account of delivery lead times, and economic order quantities. Stock levels are maintained so that the risk of running out of stock does not compromise operational objectives.</p>
d) Measuring the performance of depots	<p>An effective performance monitoring regime is in place covering service levels, unit costs and spare capacity.</p> <p>Procedures are compared and/or benchmarked. Improved procedures elsewhere are identified and are adopted across all Services and tri-Service facilities are used where cost-effective. Stock holding levels are monitored to identify possible scope for rationalisation of storage facilities.</p>

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#### Part 3: Health, safety and environmental protection

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	<i>National Audit Office best practice criteria</i>
a) Storage and use of hazardous material	<p>The Department store all material in suitable facilities (Workplace (Health, Safety and Welfare) Regulations 1992).</p> <p>The Department take steps to minimise the risks in using hazardous materials (Control of Substances Hazardous to Health Regulations 1994).</p>
b) Distributing and disposing of hazardous material	<p>The Department use qualified drivers, pack materials to the required standards, and provide all the necessary documentation to accompany materials in transport (Carriage of Dangerous Goods by Road Regulations 1996, the Chemicals (Hazardous Information and Packaging for Supply) Regulations 1994).</p> <p>The Department dispose of hazardous waste through licenced contractors, and take adequate precautions to store the waste prior to disposal (Special Waste Regulations 1996).</p>
c) The Department's monitoring arrangements	<p>The Department monitor compliance through a system of quantified audit and reporting of performance (Health and Safety Executive guidance HS(G) 65, and ISO 14001).</p>
d) Reducing the use of hazardous materials	<p>The Department eliminate unnecessary hazardous materials from the inventory, replacing them with alternative systems of work, or less hazardous substitutes (Control of Substances Hazardous to Health Regulations 1994).</p>

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## Appendix 3

### The Department's inventory management and risk factors

**1** The rationale for the Department holding stock is to protect them against the risk of stock not being available - adversely impacting on operations, for example the grounding of aircraft if spares were not available. However stockholding incurs costs - depot buildings, capital tied up in stock, distribution of stock from depots to end-users, disposal of surplus stock, and personnel and administrative costs. Depot storage does not guarantee availability - items may be out of stock, and the depot may not be able to meet all demands.

**2** We held discussions with all three Services to gain an understanding of the Department's inventory management. These discussions focused on the critical decision points in the supply process, and the attendant risks. Drawing on the various discussions, we developed a best practice inventory management decision model in conjunction with our consultants from AEA Technology (Figure 24). The model informed our subsequent analysis of the Department's hazardous inventory and supply management. At each stage there are a number of factors to be considered, as shown below.

#### Identify a requirement

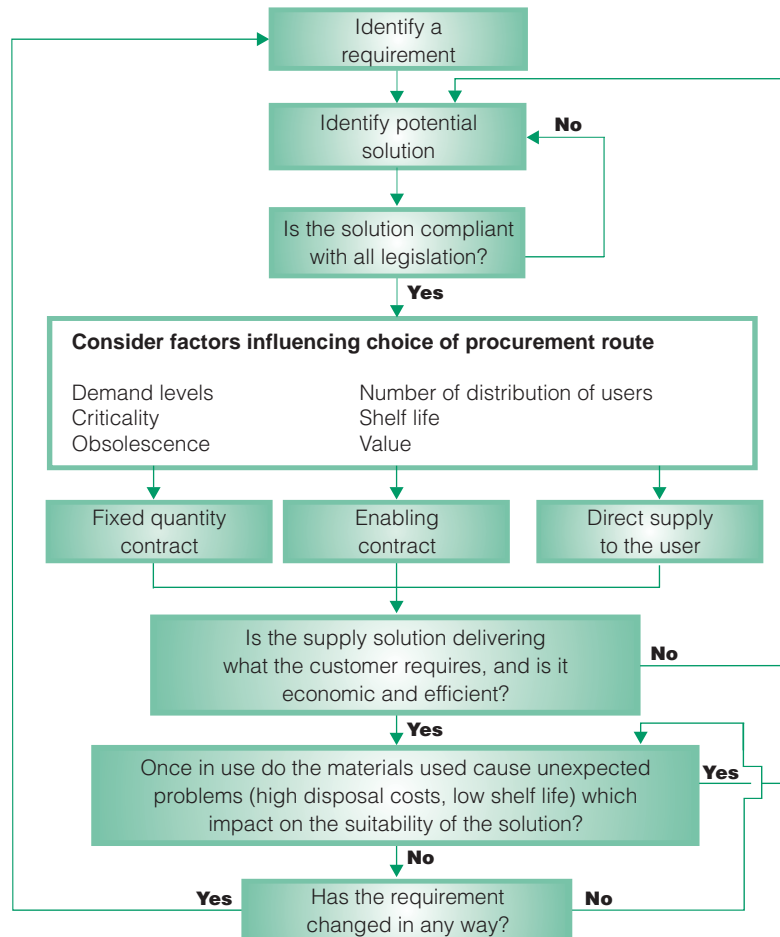
**3** Users, or designers of new equipments, specify their requirements, ideally stating in output terms, the minimum acceptable performance. This may be expressed as a 'defence standard' or other standard. However, where standards are drawn up in input terms this limits inventory managers substituting alternative, less hazardous, or cheaper, commercially available, products.

#### Potential risks:

- failure to use output-based requirements limits the number of possible solutions, and the Department's ability to obtain a competitive price.
- design authorities may over specify material.
- range of standards may result in duplication of the inventory.

Inventory management  
decision model

**Figure 24**



Source:  
National Audit Office

Figure 24 shows the elements of an inventory management decision model, and the cyclical nature of procurement, monitoring and review.

### Identify potential solution

- 4** Potential solutions to the identified requirement would include:
- an existing inventory item which could perform the task;
  - identifying a commercially available product; or
  - developing a detailed specification for a product to meet the requirement, and finding manufacturers able to produce to the specification.

**Potential risks:**

- specification, cost and contracts data may be incomplete and prevent consideration of alternatives.

**Is the solution compliant with all legislation?**

**5** Ensuring materials are compliant with legislation poses a particular problem for hazardous material. The design stage provides the most practical point to consider the need for any hazardous components of the product, and the trade-off between performance and hazardous content. Once in use, however, new regulations may add significantly to the costs or require the Department to seek alternatives to the original solution.

**Potential risks:**

- non-compliance with legislation may lead to prosecution.
- rectifying non-compliance later in the product life-cycle is costly.

**Factors influencing the choice of procurement route**

**6** The Department need to decide if their own supply system or those operated by industry provide the best value for money solution given the many factors which can influence the choice of an appropriate supply route. The factors to be considered include:

**a) Demand levels.** Some major procurements will include an initial spares procurement as part of the purchase price. This ensures that the Department can support equipment once it is accepted into service.

**Potential risks:**

- overestimating demand ties up capital and warehouse space, and life-expired stock is costly to dispose off.
- under-estimating demand could lead to the stock not being available.

**b) Number and distribution of users.** The three Services have very different operational roles in terms of deployment, and as a result have different patterns of geographical distribution, which may influence contractors' ability to provide direct supply arrangements.

**Potential risks:**

- changes in the location and size of units may alter the cost-effectiveness of the existing supply option.

**c) Criticality.** The Department's inventory includes items which are held because a failure to supply the item when required would significantly impact on operational capability.

**Potential risks:**

- failure to supply critical items will have a significant impact on operational capability.
- over specifying criticality may lead to inefficient use of resources.

**d) Shelf life.** For items with a short shelf life, depot storage can result in a higher level of wastage where actual demand is less than forecast. It may be possible for the Department to extend shelf lives for some items through physical inspection and analysis though this can be costly. Also the Department can incur disposal costs for items which have passed their shelf life.

**Potential risks:**

- life expired material may not give the same performance characteristics as when new, possibly impacting on operational effectiveness.
- short shelf life items require a much more accurate estimation of demand if wastage is to be minimised.
- the Department incur disposal costs for unused, life-expired, stock.

**e) Obsolescence.** For equipments where there is a limited production cycle, the Department may have to purchase spares in large quantities to ensure that the equipment can be supported throughout its operational life.

**Potential risks:**

- unforeseen extensions to the operational lives of equipment can cause serious problems, with further spares sometimes having to be manufactured on a bespoke basis.
- over-estimation of requirements or premature removal of equipment from service will result in significant wastage of spares.

- f) Value.** The Department's inventory items vary significantly in price. It may be sensible for inventory managers to stratify the inventory by value and concentrate their efforts on managing high value items.

**Potential risks:**

- high value items tie up more capital when in storage than low value items, making it more important to ensure that stock levels are minimised and alternative supply arrangements considered.

**Procurement routes**

- 7** The Department use three principal procurement routes for the supply of material: fixed quantity contract; enabling contract; and direct supply to the user.

**Potential risks:**

- there may be insufficient information on the storage, handling and disposal costs for the different procurement routes, leading to uninformed decisions.

**Monitor and review**

- 8** It is important to maintain an inventory management system which provides accurate information on key factors (demand patterns, delivery lead times, shelf life, economic order quantity, non-moving and slow moving stock) to ensure inventory costs are minimised.

**Potential risks:**

- insufficient monitoring and review of the supply chain may allow inefficient supply solutions to continue.

## Appendix 4

### The Department's response to the Montreal Protocol

**1** The Montreal Protocol was drawn up in 1987 with the aim of eliminating the production and use of Ozone-depleting chemicals. The Protocol was subsequently amended in 1990 and 1992 to add further chemicals to the list. The Montreal Protocol was ratified in European law under EC Regulation 594/91, and the 1992 amendment under EC Regulation 3952/92. The European Union introduced more stringent timescales for phasing out the chemicals covered by the Montreal Protocol under EC Regulation 3093/94. The principal United Kingdom Legislation covering Ozone-depleting chemicals is the Environmental Protection Act (1990) and related regulations. These controls are designed to return atmospheric levels of Chlorine and Bromine to more normal levels by the middle of the 21st Century.

**2** The Environmental Protection Act (1990) and EC Regulation 3093/94:

- prohibit the deliberate venting of controlled substances to the atmosphere. This is an offence under the Environmental Protection Act (1990). Waste material containing controlled substances must only be disposed of at suitably licenced waste disposal facilities; and
- require users of controlled substances to take all practicable steps to conserve stocks and prevent emissions by minimising leakage, and by recovering controlled substances during the maintenance and decommissioning of equipment.

**3** The Department have established a Montreal Protocol Task Force to co-ordinate compliance throughout the Department. The Department's policy is to:

- comply with the requirements of the Montreal Protocol, the related EC Regulations and national legislation;
- eliminate and replace the use of controlled substances wherever alternative substances and equipments are available, as soon as is practicable;

- not introduce any new design of equipment which contains controlled substances or calls for their use in maintenance procedures; and
- prohibit the use of Ozone-depleting substances in training activities, including fire-fighting training.

**4** However, for certain critical military applications, no alternatives to Ozone-depleting substances are available at present. These equipments and facilities such as refrigeration plants have been designated as 'Essential Uses' in line with the criteria set out by the United Nations Environment Programme. The Department operate a recycling and banking facility to support these equipments and facilities until the end of their equipment life, or until suitable alternatives are found.

# Appendix 5

## Examination of Defence Inventory Management

**1** In developing our approach to analysing the Department's inventory, we looked at the work of other countries' national audit offices, in particular the work of the Australian National Audit Office and the United States General Accounting Office.

### The Australian National Audit Office

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Performance Management  
of Defence Inventory  
Auditor – General Audit  
Report Number 5 1997-98

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- a) The Australian National Audit Office found that, despite an increased focus on inventory management in recent years, performance management practices used in the defence supply chain do not reflect best practice, and the Australian Defence Force had not identified performance measures covering total supply chain costs.
- b) The Royal Australian Air Force analysed their stock turn (the time it will take for current stock to be used), and suggested that stock levels of Breakdown Spares - the items held as spare parts for repairable equipment - could eventually be reduced by up to 75 per cent. The Australian National Audit Office estimated that this would release some \$340 million of capital tied up in stock, and provide possible annual savings of around \$46 million (12 per cent) of holding costs.
- c) The Australian National Audit Office estimated that achieving even a five per cent reduction in stock levels across the total defence inventory could yield savings - through a reduction in stocks of \$197 million and annual reductions in holding costs of some \$23 million (5 per cent).



## The United States General Accounting Office

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Defense Logistics: Much of  
the Inventory Exceeds  
Current Needs  
(GAO/NSIAD 97-71)

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Inventory Management:  
Adopting Best Practices  
could Enhance Navy Efforts  
to Achieve Efficiency  
Savings (GAO/NSIAD  
96-156)

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Defense Inventory:  
Applying Commercial  
Purchasing Practices  
Should Help Reduce  
Supply Costs  
(GAO/NSIAD 93-112)

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- d) The General Accounting Office examined the Department of Defense's £67 billion holdings of insurance items - stocks of material held for strategic purposes. They concluded that 62 per cent of stocks were not mission essential, including 22 per cent where there was no forecast demand and which were unlikely to be used. They recommended that the Department of Defense should periodically review their insurance items to ensure that they are mission essential and stocked in appropriate quantities.
- e) The General Accounting Office reviewed the United States Navy's inventory management practices, and concluded that if the Navy adopted best practices as identified in the airline industry, they could improve the responsiveness of the Navy's logistics system. This could potentially save hundreds of millions of dollars, given the Navy's \$10 billion inventory, as efficiencies in inventory management lead in turn to reduced stockholdings.
- f) The General Accounting Office found that the Department of Defense were not calculating the optimum size of orders, partly because they had insufficient data. Private sector companies were using a more rigorous approach when calculating order quantities, and they were consequently able to achieve significant reductions in their stock levels.

## Reports by the Comptroller and Auditor General, Session 1997-98

The Comptroller and Auditor General has to date, in Session 1997-98, presented to the House of Commons the following reports under Section 9 of the National Audit Act, 1983:

Regulation and Support of Charities.....	HC 2
Managing the Millennium Threat.....	HC 3
University of Portsmouth.....	HC 4
The Skye Bridge.....	HC 5
The Contract to Develop and Operate the Replacement National Insurance Recording System.....	HC 12
Contingent Liabilities in the Dependent Territories.....	HC 13
Sales of Scottish New Towns' Commercial and Industrial Properties.....	HC 14
Vacant Office Property.....	HC 17
Ministry of Defence: Improving the Efficiency of the Procurement of Routine Items.....	HC 31
Inland Revenue: Employer Compliance Reviews.....	HC 51
Highlands and Islands Enterprise: Value for Money Review of Performance Measurement.....	HC 64
Contracting Out of Career Services in England.....	HC 113
Protecting Environmentally Sensitive Areas.....	HC 120
Measures to Combat Housing Benefit Fraud.....	HC 164
Tenants' Choice and the Torbay Tenants Housing Association.....	HC 170
Ministry of Defence: Major Projects Report 1996.....	HC 238
The Sale of the Married Quarters Estate.....	HC 239
The Management of Growth in the English Further Education Sector.....	HC 259
Further Education Colleges in England: Strategies to Achieve and Manage Growth.....	HC 260
The PFI Contracts for Bridgend and Fazakerley Prisons.....	HC 253
Exchange of Information on Direct Taxation within the European Union.....	HC 276
Prison Catering.....	HC 277
Cataract Surgery in Scotland.....	HC 275
Examinations at Grant-Maintained Schools in England 1996-97.....	HC 301
The Sale of PSA Projects.....	HC 345
Audit of Assumptions for the Pre-Budget Report, November 1997.....	HC 361

Regulating and Monitoring the Quality of Service Provided to Customers by the Water Industry in England and Wales .....	HC 388
Crown Prosecution Service.....	HC 400
The Management of Sickness Absence in the Metropolitan Police Service .....	HC 413
The Defence Evaluation and Research Agency: Review of Performance.....	HC 411
The Management of Building Projects at English Higher Education Institutions .....	HC 452
The Private Finance Initiative: The First Four Design, Build, Finance and Operate Roads Contracts.....	HC 476
Construction of the Southampton Oceanography Centre .....	HC 494
The Sale of The Stationery Office .....	HC 522
HM Coastguard: Civil Maritime Search and Rescue .....	HC 544
The Home Energy Efficiency Scheme .....	HC 556
Reform of Customs Transit in the European Community .....	HC 566
The Monitoring and Control of Tax Exemptions for Charities .....	HC 575
Privatisation of the Rolling Stock Leasing Companies .....	HC 576
Water Pensions: Deficit in the Closed Fund .....	HC 590
The Purchase of the Read Codes and the Management of the NHS Centre for Coding and Classification.....	HC 607
The Distribution of Lottery Funds by the English Sports Council .....	HC 617
Audit of Assumptions for the Budget, March 1998.....	HC 616
Sale of AEA Technology .....	HC 618
Obtaining a Benefit for Electricity Customers from the Flotation of the National Grid.....	HC 651
Grants to Voluntary Bodies .....	HC 655
Countering Anti-competitive Behaviour in the Telecommunications Industry .....	HC 667
The Performance of the NHS Cervical Screening Programme in England.....	HC 678
The Annual Report of the European Court of Auditors for 1996 .....	HC 679
Investigation of Misconduct at Glasgow Caledonian University .....	HC 680
Underpayments to Public Service Pensioners on Invalidity Benefit.....	HC 681

Corporate Governance and Financial Management in the Scottish Further Education Sector .....	HC 682
Disposal of Forest Land .....	HC 688
The Forensic Science Service .....	HC 689
The Sale of British Energy.....	HC 694
Major Projects Report 1997.....	HC 695
Managing the Millennium Threat II .....	HC 724
Sales of the Royal Dockyards .....	HC 748
Cost Over-runs, Funding Problems and Delays on Guy's Hospital Phase III Development.....	HC 761
Identifying and Selling Surplus Property .....	HC 776
BSE: The Cost of a Crisis .....	HC 853
The Prevention of Drug Smuggling.....	HC 854
Benefits Agency: Performance Measurement .....	HC 952
A Case Study of Stores Management in the Ministry of Defence.....	HC 951