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SEVENTH REPORT
FROM THE
ESTIMATES COMMITTEE

TOGETHER WITH PART OF THE MINUTES OF
THE EVIDENCE TAKEN BEFORE SUB-COMMITTEE C,
APPENDICES AND INDEX

Session 1964-65

**ELECTRICAL AND ELECTRONIC EQUIPMENT
FOR THE SERVICES**

*Ordered by The House of Commons to be printed
3rd November 1965*

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Wednesday, 25th November, 1964

The Estimates Committee was nominated of—

Mr. Bagier,	Sir Harwood Harrison,
Mr. Bence,	Mr. Hopkins,
Mr. Bessell,	Mr. Hugh Jenkins,
Mr. Blenkinsop,	Mr. Dan Jones,
Sir Edward Boyle,	Sir John Langford-Holt,
Dr. Bray,	Captain Litchfield,
Mr. Robert Cooke,	Mr. Gregor Mackenzie,
Mr. Cooper,	Mr. Marten,
Sir Beresford Craddock,	Mr. Maxwell,
Sir Henry d'Avigdor-Goldsmid,	Mr. Stratton Mills,
Dr. Duffy,	Mr. Monslow,
Mr. Dunn,	Mr. Owen,
Mr. Robert Edwards,	Mr. Rankin,
Mr. Ensor,	Mr. Rees,
Sir Eric Errington,	Mr. Rhodes,
Mr. Hugh Fraser,	Mr. Shore,
Sir Myer Galpern,	Mrs. Short,
Sir Richard Glyn,	Sir Spencer Summers,
Mr. Gresham Cooke,	Sir Leslie Thomas,
Mr. Gurden,	Sir Richard Thompson and
Mr. Hall,	Mr. Woof.
Mr. William Hamilton,	

Friday, 11th December, 1964

Ordered, That Sir Myer Galpern be discharged from the Estimates Committee ; and that Mr. Edward Fletcher be added to the Committee.

Tuesday, 27th April, 1965

Ordered, That Mr. Hall be discharged from the Estimates Committee ; and that Mr. Stainton be added to the Committee.

The cost of preparing for publication the shorthand Minutes of Evidence taken before Sub-Committee C was £530 17s. 10d.

The cost of printing and publishing this Report is estimated by Her Majesty's Stationery Office at £1,500 0s. 0d.

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NOTES

In the Report, references to the Minutes of Evidence are indicated by the letter "Q" followed by the number of the Question referred to. References to Memoranda included in the Minutes of Evidence are indicated by the word "Evidence" followed by the number of the page referred to. References to Memoranda included in the Appendices are indicated by the words "Appendix—" followed by the number of the page referred to.

In the Minutes of Evidence a row of asterisks indicate that the Evidence has not been reported.

SEVENTH REPORT

The Estimates Committee have made further progress in the matter to them referred and have agreed to the following Report:—

**ELECTRICAL AND ELECTRONIC EQUIPMENT
FOR THE SERVICES**

INTRODUCTION

Scope of the Enquiry

1. Your Committee referred to Sub-Committee C the Defence Estimates and the Civil Estimates Class IV, Vote 7, Ministry of Aviation, Class IV, Vote 8, Ministry of Aviation (Purchasing (Repayment) Services), and Class IX, Vote 14, Stationery and Printing, in so far as they relate to electrical and electronic equipment for the Services. The Sub-Committee received oral and written evidence from the Ministry of Defence (Central), the Ministry of Defence (Navy Department), the Ministry of Defence (Army Department), the Ministry of Defence (Air Force Department), the Ministry of Aviation, the Treasury, the Stationery Office and the Electronic Engineering Association. They took evidence at the Central Ordnance Depot, Donnington, the Royal Air Force Supply Control Centre, Hendon, and the Royal Naval Store Depot, Copenacre; a visit was also made to the Royal Radar Establishment, Malvern.

2. Your Committee are submitting another Report, based on evidence given before Sub-Committee D, on non-warlike stores used by the Services. To some extent inevitably the two enquiries have overlapped and much of the information of a general nature obtained by Sub-Committee C relating to such matters as methods of provisioning and storage of electronic equipment differs in few, if any, respects from that obtained by Sub-Committee D in their examination of non-warlike stores. Your Committee do not, therefore, propose to deal in detail with the general aspects of stock control and storage of equipment which are covered in their other Report, but will confine themselves to specific problems relating to electrical and electronic equipment.

3. One of the difficulties which has faced Your Committee is to determine what is and what is not electronic equipment. As one witness told Sub-Committee C "Electronics is a technique, a modern technology, in the same sense as hydraulics or mechanics" (Q. 1033); while there are a large number of equipments which can clearly be defined as electronic equipment, such as radar sets, there are also a number of equipments which happen to embody electronic techniques and cannot be regarded solely as electronic equipments. In their original Memorandum the Ministry of Defence attempted to set out the amount spent by each of the Service Departments on electrical and electronic equipment in the current and preceding two financial years.¹ These figures, do not, however, by any means represent the total expenditure. They do not take account, for example, so far as the Ministry of Defence (Air Force Department) are concerned, of

¹ Evidence, pp. 7, 10, 15.

expenditure on electronic items which form an integral part of guided missiles. They do not include expenditure on computers, which is borne on the Stationery Office Vote, but which may fairly be described as electronic equipment for the Services. Finally, the figures given by the Ministry of Defence relate solely to production expenditure. Expenditure on research and development is borne very largely by the Ministry of Aviation. Sub-Committee C were supplied with some figures of the expenditure in this field in the current and preceding two financial years, but this information is regarded by the Ministry of Aviation as classified, and cannot therefore be published.

4. In the light of these difficulties it is impossible for Your Committee to state with any degree of accuracy exactly how much is spent by or for the Services on electrical and electronic equipment. It would, therefore, be unrealistic to devote an undue proportion of the Report to financial details. Your Committee have thought it right instead to concentrate mainly on the methods and procedures used by the various Departments, and to describe in some detail particular types of equipment only where they serve as an illustration of how the procedures have or have not worked.

The Problem of Security

5. Even if Your Committee thought it feasible to attempt to describe the whole range of electrical and electronic equipment used by the Services, they would have come up against the practical difficulties of security considerations. There is nothing new about this problem. As long ago as 1946-47 the then Select Committee on Estimates in their Fourth Report¹ complained of the reluctance of Departments to supply information on defence matters. It would be churlish of Your Committee not to recognise that there has been some improvement since then. In the present enquiry they found Departments willing to provide a number of facts of a confidential nature, but met with difficulties at a later stage, when consideration had to be given to the question of how much of the information supplied should be published.

6. Your Committee recognise at once that electrical and electronic equipment is a highly sensitive subject from the security point of view, and it would be quite wrong to seek to disclose, for example, details of the research being carried out at the Ministry of Aviation research establishments. It is also, of course, difficult for Your Committee to determine in all cases what is or is not secret or confidential; the views of the Department concerned must command respect. For this reason Your Committee have had to frame the nature of their remarks on certain matters in such a way as not to reveal information which Departments have asked should not be published. Inevitably this has to some extent diminished the impact of the comments of Your Committee.

7. Your Committee cannot accept that this situation is entirely satisfactory. They are far from convinced that it is really necessary to keep secret some of the facts about, for example, levels of stockholding or siting of equipment. Furthermore there were occasions when a Department was forced

¹ H.C. 1946-47, 135.

to admit that there was no real reason why evidence which it had originally asked to be withheld should not in fact be published. There appeared at times to be clear inconsistencies between Departments. For example, the Ministry of Defence (Army Department) stated quite freely that their main storage depot of electrical and electronic equipment was at Donnington. Similarly, the Ministry of Defence (Navy Department) had no scruples about revealing the existence of Copenacre. The Ministry of Defence (Air Force Department) on the other hand attempted to withhold publication of the location of their main storage depots of electrical and electronic equipment, on the grounds that it had never been published before. The information has now been made available.¹

8. Your Committee are not so much concerned about the difficulties to their Report caused by such examples of unnecessary secrecy. What causes them real anxiety is the danger to national security presented by this practice. Regular classification of information which can safely be disclosed causes the system to become meaningless and consequently disregarded. The deplorable effect of this is that information of a really secret nature ceases to be adequately protected. The importance of this point has been made in a number of Reports relating to security matters, notably in the Radcliffe Report on Security Procedures in the Public Service,² and more recently, by implication in the Report of the Standing Security Commission.³ Your Committee are not making a full scale enquiry into security procedures but they consider a realistic approach to security classification in the Defence Departments and the Ministry of Aviation, where, inevitably much classified material is held, is essential for proper control of really secret information. Too often there is a general tendency for Departments to classify certain information and refuse to disclose it, not because disclosure would prejudice national security, but because it might cause departmental inconvenience. They consider also that they have a right on behalf of the House to demand that as much information as possible, consistent with the needs of national security, should be given, not only to Select Committees in confidence, but to the House of Commons as a whole and thereby to the general public. In the field of electronics the information supplied to the House in the Estimates is thoroughly inadequate, far less than is given, for example, to the Congress of the United States. Moreover, with rapidly evolving techniques, a piece of electronic equipment may be highly secret one year, and almost obsolete the next. Your Committee recommend that a thorough-going review should be undertaken of the security classification of electrical and electronic equipment for the Services including the desirability of regular re-classification after a lapse of time.

THE SYSTEM FOR OBTAINING EQUIPMENT

Determination of Requirements

9. When dealing with electrical and electronic equipment, which can be both costly and technically difficult to produce, it is clearly of fundamental importance that the procedures carried out by the responsible Departments are of such a nature that so far as possible the equipment that is needed, is

¹ Evidence, p. 13. ² Cmnd. 1681. ³ Cmnd. 2722.
39461

obtained with the maximum speed at the minimum price. It is with these considerations in mind that Sub-Committee C heard evidence from the Ministry of Defence and the Ministry of Aviation. They first sought to establish that there was a proper system of control within the Departments for scrutinising a project at all stages to ensure that it remained operationally necessary and that its cost did not increase to an unwarranted extent.

10. In Annex A of their original Memorandum¹ the Ministry of Defence set out the procedures followed as a result of the unification of the former Ministry of Defence and the Service Departments. There are now two central co-ordinating committees which deal with requirements for the Services as a whole. The Operational Requirements Committee is charged with reviewing long-term equipment requirements and examining, harmonising and approving new requirements; the Weapons Development Committee is charged with advising the Secretary of State on the projects to be included in the development programme and keeping that programme under review. The two committees have an overlapping membership and work closely together. Before these two committees came into being there had existed a Defence Research Policy Committee to co-ordinate research and development, but there was no central machinery for the co-ordination of operational requirements.

11. Clearly it would be impracticable for every proposal for new equipment to undergo scrutiny by the two central committees. There are, therefore, a number of criteria laid down which determine the extent to which a project undergoes examination. These were set out in full in a Memorandum by the Ministry of Defence,² and amplified in evidence. The main criteria are financial. The full scrutiny of the Operational Requirements Committee is required for any project whose total cost in any one year is likely to exceed £2 million; similarly the Weapons Development Committee examine in detail any project of which total extramural research and development costs are likely to exceed £500,000. A project of which the total cost is likely to exceed £500,000 in any one year or which, although estimated to cost less than £500,000, is likely to make a significant call on research and development resources, is normally endorsed by the Assistant Chief of the Defence Staff (Operational Requirements) on behalf of the Operational Requirements Committee, and by the Assistant Chief Scientific Adviser (Projects) on behalf of the Weapons Development Committee. Projects below these levels are not normally considered in detail by the committees, but additional criteria are sometimes applied which enable controversial or technically difficult projects to undergo the full committee procedure, although expenditure may be relatively small (Q. 10). Increases in costs of projects are referred back to the Weapons Development Committee if they exceed £10 million for projects estimated to cost more than £100 million for development, £5 million for projects estimated to cost between £25 million and £100 million, and 20 per cent if this exceeds £500,000 (Q. 46).

12. From the point of view of achieving continuous scrutiny over the progress of important projects, Your Committee consider that the new procedures appear to be satisfactory, although since they have only been in

¹ Evidence, pp. 2-3. ² Appendix 1, pp. 261-262.

operation a comparatively short time it is too early to state that they have worked well in practice. Certainly the description given by the Ministry of Defence of the processes undergone by a typical hypothetical future project¹ show no lack of scrutiny at successive stages. Another advantage of these procedures is that a representative of the Treasury, viz. the Under Secretary, Defence (Policy and Material), attends meetings of the Weapons Development Committee, and is thus fully in touch with project planning. When financial approval for the project has to be sought from the Treasury, therefore, there is no need for the Treasury to make extensive enquiries afresh about the nature of the scheme (Q. 1547). What the procedures outlined above do not in themselves do, is to overcome the difficulties caused by constantly increasing costs which may be one cause of delay in bringing the project to fruition.

Research

13. The history and indeed the cost of any project begins with research. In relation to electrical and electronic equipment the cost and responsibility for research is borne almost entirely by the Ministry of Aviation. A brief account of the function of the research programme of the Ministry was given in their original Memorandum to Sub-Committee C.² The programme consists of "aimed research in support of projects to meet operational requirements and general research with the object of increasing the Ministry's knowledge and authority to assist in the formulation of future requirements and in the supervision of development work carried out by industry".³ The establishments of the Ministry of Aviation concerned with electronic research and development are the Royal Radar Establishment at Malvern, dealing primarily with radar, the Signals Research and Development Establishment at Christchurch, dealing mainly with telecommunications, and the Radio Department at the Royal Aircraft Establishment, Farnborough, which is concerned with various types of airborne electronic equipment other than radar (Q. 1033). The main problems which Your Committee have sought to answer concern the direction of the research effort, and the division of the effort between industry and the Ministry of Aviation establishments. They are unable to be as specific as they would wish in discussing these questions since the nature of the research carried out and its cost cannot be disclosed. There are certain points of a general nature, however, which can be made.

14. The general co-ordination of the research work of the Ministry of Aviation is carried out by the Chief Scientist, acting with the advice of the Directors-General of Research and Development and the various Directors of Research (Q. 1036). The initial idea for a piece of research is within the responsibility of the Director of the establishment concerned; once it has been formulated it is included in the various reviews which take place at different levels. Each Director-General undertakes the reviews of his technical area at half-yearly intervals; the Chief Scientist deals with all establishments on an annual basis (Q. 1039). There is day to day liaison between the scientists at the Ministry of Aviation establishments and officers in the Service Departments of the Ministry of Defence, so that the long-term needs of the Departments can be understood. Furthermore, there is in

¹ Appendix 2, pp. 262-263.

² Evidence, pp. 134-138.

³ Evidence, p. 135

existence the Electronics Research Council, containing eminent scientists in the electronics field as well as staff from the Ministry of Aviation and the Ministry of Technology, whose task is to supply ideas for new research "to ensure that we do not begin to get too much in-breeding" (Q. 1036).

15. The amount of research carried out at Ministry of Aviation establishments has increased in the last year.¹ It is greater in terms of cost than the amount of money spent by the Ministry on research contracts with industry, but, as representatives of the Electronic Engineering Association pointed out, industry undertakes a considerable volume of research from its own funds (Q. 1438) so that in total the amount spent by industry may be the greater. Of the amount spent by Ministry of Aviation establishments just under half is aimed at specific though not necessarily immediate operational requirements; the remainder is spent on research into materials, techniques and so on (Q. 1057). Research contracts placed with industry were described as being "an adjunct of the research programme of the establishment which sponsors the contracts" (Q. 1035). The amount of money spent on research contracts with industry has not varied greatly in the last few years,² although a Ministry of Aviation witness asserted that it was the policy of the Ministry to increase the amount of research undertaken in industry, and that this was being done (Q. 1645).

16. It is clearly important to ensure that there is no wasteful overlapping in the research carried out by the Ministry of Aviation establishments and by industry and that the Ministry are fully aware of what is going on in industry, not only with regard to the research contracts sponsored by the Ministry, but also the general programme of industrial research. There is a distinction between duplication of effort between individual firms, and duplication of effort between the firms and the Ministry of Aviation. The former is desirable; as one witness from the Electronic Engineering Association told Sub-Committee C "some duplication of research before a problem has been solved may in fact be a good thing, because one of several teams may on occasion arrive at an answer which would be missed by another team" (Q. 1384). Duplication between the Ministry of Aviation and industry in the field of specific research contracts is not desirable but neither the Ministry nor the industry considered that this took place to any extent (Q. 1053, 1384). In the field of research carried out by industry under Government contract, the general programme of work will have been laid down when the contract is placed. There is thereafter regular liaison between the scientists in the establishment who have initiated the research and the firm undertaking a particular piece of research (Q. 1059). This liaison may be at all levels (Q. 1060). Sub-Committee C were given an example of how collaboration works out in practice.³ So far as awareness of the private research carried out by industry is concerned, the Ministry of Aviation stated that, although firms in the electronics field were naturally concerned not to reveal their programmes to each other, they did talk very freely to the Ministry and there was a considerable degree of confidence built up over the years (Q. 1053). The Electronic Engineering Association confirmed that the Ministry's knowledge of what was going on in industry was good (Q. 1384). This awareness

¹ Evidence not reported.

² Ibid.

³ Ibid.

must continue to be maintained ; Your Committee regard a regular series of progress reports from all electronics firms, given naturally in close confidence, as an essential part of the research planning of the Ministry of Aviation.

17. The problem of how much Government sponsored research should be undertaken by industry is difficult. The Electronic Engineering Association accepted that some research must be carried out in Government establishments (Q. 1321). At the same time they naturally feel that more research contracts could and should be placed with industry (Q. 1322-23). The main argument in support of this view is that industry is better equipped to see the commercial prospects arising from particular lines of research and to exploit them (Q. 1322). There are two main arguments on the other side for carrying out research in Government establishments. In regard to general research there must be "systems thinkers" to consider all the techniques relating to, for example, the complexity of equipment necessary for a surface to air guided weapons system, which no one firm has the necessary expertise to do (Q. 1052). On particular matters it is the task of the Ministry of Aviation establishments to supervise the technical work on development of equipment carried out by industry ; this they cannot do with the necessary knowledge and authority unless they have undertaken research into this subject themselves (Q. 1035). Your Committee recognise that there is force in the argument used by both sides, and they would not wish in any way to lessen the control of expenditure exercised by the Ministry of Aviation. Nevertheless they feel that there may be a case for increasing the number of individual research contracts given to industry ; as has been pointed out, although it is the policy of the Ministry of Aviation to increase the number of extramural research contracts, the money spent on this has remained fairly constant in recent years, whereas expenditure in the establishments has increased. It is also possible that research in a given field may enable a firm, which will have in any case to carry out the development programme for the project, to increase its proficiency in this field and thereby lessen the eventual cost of development. Your Committee recommend that the Ministry of Aviation should review the programme for individual research projects with a view to increasing the proportion of contracts placed with industry.

Development

18. Your Committee now turn to what is undoubtedly the most crucial phase in the procurement of equipment. In the case of a new and complex piece of equipment there are three main stages towards full development. When an initial staff target has been prepared by the Ministry of Defence setting out in very general terms what is required, the Ministry of Aviation undertake a feasibility study to see whether such an idea is practicable ; this may be done under contract by one or more firms (Q. 1046). Once the feasibility of a project has been established, an operational requirement is prepared and approved within the Ministry of Defence and a project study is placed with industry, possibly with more than one firm, at the end of which a technical specification is drawn up of the equipment to be developed for production, including an estimate of the cost of both development and the unit production price (Q. 1048). On the basis of this project study the decision is taken whether or not to proceed to full development. If the

decision is favourable, a development contract is placed. An estimate of the time and cost of development and the cost of production has already been prepared. As has been stated, if the estimated cost rises during the course of development above a certain level the project is reviewed again by the Weapons Development Committee and the Treasury (Q. 46, 1063). These procedures follow the ideas laid down in the Zuckerman Report on the Management and Control of Research and Development, the main object of which was to stress the importance of the project study as a basis of decision whether or not to proceed to full development (Q. 1116, 1458).

19. There are two principal and closely linked difficulties inherent in the procedures outlined above. There is first the problem of correct cost estimating. The Weapons Development Committee and the Treasury need to be given a figure on which to base their decision; the Ministry of Aviation pointed out that the system of budgeting for the defence programme compelled them to submit estimates at a stage much earlier than any commercial undertaking could possibly commit itself to a price, and that it was extremely difficult to estimate accurately before the development phase had taken place, particularly for a piece of equipment embodying new techniques (Q. 1122, 1125-26). The second difficulty is the time factor. The lengthiness of the procedures in certain cases was stressed by the representatives of the Electronic Engineering Association, who pointed out the problems caused by delay between stages of the programme. If a project is long delayed, its ultimate usefulness is affected; between phases, while the project is being considered by Departments, the men engaged on a project have to be held together without being fully employed, which is both bad for morale and costly (Q. 1305-1310). Delay in itself is a cause of rising costs, which will produce further delays while the project is reconsidered, and a vicious circle quickly develops. The complaint of the Electronic Engineering Association is illustrated by the programme of what is admittedly a hypothetical project already referred to above (see paragraph 12).¹ In this example there is a delay of nine months between the report of the project study in June 1967 and the placing of the development contract in March 1968.

20. The ideal solution to these problems would be to ensure that the original estimate of development and production costs was so accurate that there was never any need to refer the matter back for reconsideration and possibly an awkward political decision to cancel a project at a late stage. Such a solution would obviously be of benefit to all concerned, but it would be unrealistic to suppose that, particularly in the field of electronics, it was ever likely to occur. It certainly has not occurred to date. There has not been a case when the original estimate has been too high (Q. 101); as a Ministry of Defence witness told Sub-Committee C "it is a general tendency for the very earliest cost estimated for most projects to be dramatically below what they cost when they are thoroughly looked into" (Q. 55). Your Committee accept that this must almost inevitably be so, but they are concerned to see that the situation should be remedied as far as is humanly possible. To a large extent they consider that it is the means by which the Ministry of Aviation estimate the costs of a project which offer the best chance of

¹ Appendix 2, pp. 262-263.

improvement, but they believe that it may be possible to speed up certain aspects of the procedures for approving a project ; this in itself, if achieved, could lessen the eventual costs.

21. The Electronic Engineering Association, while accepting that the Zuckerman procedures were in general sensible, suggested three ways in which the system might be speeded up. They believed that there should be a greater amount of research in techniques in advance of a project programme, they asked for clear co-operation between the Ministry and industry, and they suggested that in a given phase, such as the feasibility study or project study, an effort should be made to resolve the major points about three quarters of the way through the time allotted for the study rather than leave consideration until the study had been completed (Q. 1311). The Ministry of Aviation accepted the first suggestion, subject to the qualification that there must be some limitation on the amount of research on techniques, and that to some extent they must be guided by potential operational requirements (Q. 1454). Your Committee consider that their recommendation to increase the number of research contracts put out to industry will assist in this regard. The question of closer co-operation did not, in the view of the Ministry, raise any problem since "we have virtually an ever-open door" (Q. 1455); any further steps to increase co-operation would obviously be welcome to both sides. The third point is perhaps the most important; on this both the Ministry of Aviation and the Ministry of Defence had reservations and doubted whether the gap between the completion of one phase and the decision to proceed to the next phase could be bridged to any great extent. A Ministry of Defence witness pointed out that there were frequently competitive feasibility studies which had to be assessed to determine which was the better or whether there should be some combination, and that modifications would almost certainly be necessary before the next stage (Q. 61). A Ministry of Aviation witness reasserted the basic principle of the Zuckerman procedures, that it was on a close examination of the project study that a decision to proceed to full development is taken, and that this necessarily adds to the time-scale (Q. 1458).

22. Your Committee accept the force of these arguments, but they do not consider that they necessarily undermine the validity of the suggestion made by the Electronic Engineering Association. Obviously there must be a careful decision taken by the appropriate authorities at each stage. However, there seems no real reason why the decisions cannot begin to be taken at a rather earlier stage. It should be reasonably apparent, for example, three quarters of the way through many project studies what the main problems are and what conclusions are likely to be reached. It should then be possible for the Operational Requirements Committee, the Weapons Development Committee and the Treasury to begin preliminary consideration of whether to proceed or not. In some cases it may be apparent at a fairly early stage that technical difficulties may be insuperable, that the time scale will be too great, or that the costs will be too high; a decision not to proceed further at this stage would be of help to all concerned. In other cases, when all has proceeded smoothly, it should be apparent that, unless unforeseen snags occur, the project is likely to work out as planned; conditional approval for full development could then be given, which would, of course, be reviewed

at the conclusion of the project study. Such decisions could not perhaps be taken in all cases, and it might well be that, even if they could, the time and money saved would be comparatively little; in suitable cases, however, Your Committee consider that such a practice would be helpful and could lead to economies. They recommend that, wherever possible, interim reports of feasibility studies and project studies should be made so that preliminary decisions on whether to proceed to the next phase can be taken.

23. There is a clear distinction between the type of contract agreed for development and that agreed for production. In essence a development contract is on the basis of the ascertained cost together with a certain amount of profit for the contractor, whereas the production contract is normally on a fixed price basis. The reason for making a development contract on a cost plus basis is that a contractor would run too great a risk with a fixed price contract unless his quotation was so high that the Ministry could not accept it (Q. 1094). Your Committee accept that this is necessary, and they therefore sought to ascertain what control the Ministry of Aviation exercised over the progress of a development contract. Each contract has a project officer at headquarters whose task is to see a development project through to completion. The appropriate Ministry establishment is responsible for monitoring the progress of the technical development. The contractor is required to make regular progress reports, usually quarterly, on the state of development and the relationship of financial expenditure incurred to the original estimate (Q. 1062). If costs rise above a certain level, the Weapons Development Committee must reconsider the matter (Q. 1063). The project officer can call on the assistance of the Technical Cost branch of the Contracts Division of the Ministry of Aviation, e.g. for advice about the probable costs and about the efficiency of the development contractor. This association of Technical Cost staff with the early stages of projects enables them to build up knowledge of the projects which is of value to the Contracts Division when the time comes to negotiate prices for production contracts.

24. Your Committee are not entirely satisfied with the amount of control exercised by the Ministry of Aviation over the development contract. This is a matter of the highest importance, not only because of the expense involved in development, and the need to ascertain costs accurately as soon as possible, but also because of the very close link between development costs and costs of production. The Ministry of Aviation gave several reasons why in a great many cases, particularly with intricate new equipment, the development contractor and the production contractor were necessarily one and the same firm (Q. 1105). Your Committee accept the validity of these reasons, which make it all the more necessary to control the development cost as much as possible. They note that the Ministry of Aviation themselves are not satisfied with this aspect and are now carrying out a major review of the process of development cost estimating with the help of management consultants and the co-operation of, among others, the Electronic Engineering Association (Q. 1116-1117). It is hoped that the review will be completed within a year (Q. 1120), and Your Committee trust that its outcome will be fruitful. Meanwhile, however, there is one point which they consider should be dealt with at once. At present there is no guarantee that the technical cost estimator associated with the development project can

give his full time to it (Q. 1108–1109), nor that the same man will be available at the production stage (Q. 1114). Your Committee share the view of the Ministry that this is an important matter, and they consider that any money spent on extra staff employed in this connection will be more than repaid by the greater effectiveness exercised over the control of the project. They recommend that the Ministry of Aviation, in consultation with the Treasury, should ensure that the Contracts Division is so staffed that a technical cost estimator can be attached to and remain with each major project throughout both the development and the production phase.

Production

25. Your Committee have already explained the difference in the basis for agreeing development contracts and production contracts. They do not wish to go into the details of the arrangements for fixing a production contract. This matter was dealt with at some length in the second Report of Sir John Lang¹, and in this Report Your Committee have concentrated on following up one or two of the most important aspects. The Lang Report stressed the importance of the Ministry of Aviation achieving "equality of information", that is to say that, in the relationship between the Ministry and their contractors up to the time when prices or target costs are fixed, the Ministry staff should have access to a contractor's shop floor, manufacturing facilities and records on any contract, for the sole purpose of fixing prices or target costs on that contract. Both the Ministry (Q. 1086) and the Electronic Engineering Association (Q. 1348) welcomed this idea, but as yet the recommendations of the Lang Report have not been implemented or even discussed (Q. 1346–1347). Both sides are also anxious to fix a contract price as early as possible; the industry in order to prevent the contract becoming virtually a cost plus contract (Q. 1348), the Ministry because they recognise that a fair and reasonable fixed price agreed at an early stage is a valuable incentive to efficiency. The Ministry are also concerned that there should be no gap between the investigations by their staff and the final fixing of the price during which the knowledge of the contractor may become greater than the knowledge of the Ministry (Q. 1098). One way suggested by the Electronic Engineering Association for speeding up the negotiations is to integrate the various sections of the Ministry of Aviation which are concerned with price fixing. At present it is the duty of the Technical Costs branch in connection with production contracts to furnish the Directorates of Contracts with estimates of labour and material costs and it is the duty of the Accountancy branch to furnish the Directorates of Contracts with information about overhead costs. The Contracts officers use all this information as the basis of their price negotiations with the contractor. Until recently the accountants were in a separate division of the Ministry but have now been transferred to the Contracts Division and come under the same Under Secretary as the Technical Costs branch and the Directorates of Contracts. Paragraph 74 of the second Lang Report discusses an alternative arrangement under which the Contracts, Technical Costs and Accountancy staffs would be integrated into small teams each of which would be responsible for all the purchasing, technical cost and

¹ Cmnd. 2581.

accountancy work for a range of equipments. The Lang Inquiry discussed this suggestion with officers of the Ministry who expressed the view that any necessary improvements in the planning, harmonisation and control of the activities of the three branches could be secured by less striking methods particularly if increased staff were provided and the Lang Inquiry came to the conclusion that in the short term the Ministry ought to rely on such less drastic action. The Lang Inquiry went on to record that if satisfactory results were not achieved in this way the Ministry ought to give further thought to an integrated organisation of the kind mentioned. The Ministry are still of the view that their present type of organisation is on balance preferable but are considering whether a pilot experiment in integration is worthwhile (Q. 1357). The difficulty seems mainly one of staffing: Your Committee have already made one recommendation about the staffing of the Contracts Division which they believe will lead to greater efficiency and economy; the possibility of further integration should be considered in conjunction with this and with the Ministry's general conclusions on the recommendations of the Lang Report. Your Committee recommend that the Ministry of Aviation should reach a decision on the recommendations of the Lang Report in the very near future, and should give serious consideration to further reorganisation of the staffing of the Contracts Division.

Inspection

26. Before any piece of equipment is issued to the appropriate Service Department it undergoes inspection. There are separate inspection organisations within the Ministry of Aviation and the Ministry of Defence (Navy Department); the Ministry of Defence (Army Department) also have an inspection organisation, which is not however, concerned with electrical and electronic equipment. So far as the Ministry of Aviation are concerned, about 95 per cent. of the inspection is carried out under "the Inspection approved firms" system (Q. 1145). This means in effect that the firm carries out its own inspection procedures after complying with the requirements of the Ministry. These were stated in evidence to Sub-Committee C (Q. 1145). Broadly, the firm must have a sufficient staff of properly qualified inspectors with sufficient accommodation and equipment for testing, a foolproof system of records, and satisfactory storage arrangements for separating inspected and non-inspected stores. When contracts are let to firms too small to justify the establishment of their own inspectorate, inspection is carried out direct by the inspectors from the Ministry of Aviation.¹ The Electronic Engineering Association regard the inspection approved firms system as very satisfactory (Q. 1362), and Your Committee share their view, since it leads to a saving of staff within the Ministry without seriously lessening their effective control over the quality of the equipment provided.

27. One point which caused Your Committee some concern with the possible overlapping of the Inspectorates of the Ministry of Defence and the Ministry of Aviation, and they enquired whether consideration had been

¹ Evidence, p. 137.

given to the possibility of establishing a common Inspectorate. The history of separate inspectorates goes back apparently to 1889 (Q. 1141), but there has in recent years been a considerable effort to rationalise their procedures. The Ministry of Defence (Navy Department) have now integrated their divisions engaged on underwater, surface, radio and computer work into two geographical groups, one based in Manchester, the other in London¹ (Q. 827). The Ministry of Aviation have their own Electrical Inspection Department based at Bromley operating in five geographical regions (Q. 1139). There is in existence a Defence Inspection Committee consisting of representatives of the Defence Departments and the Ministry of Aviation whose task is to ensure common standards and to prevent duplication of effort. It has a Technical Sub-Committee, meeting once a month, and a number of working parties examining such questions as common documentation, training, approval of firms, inspection procedures and so on (Q. 828). A Ministry of Aviation witness claimed that there was at present "a great deal more co-ordination of procedures and inspection facilities than perhaps is generally appreciated, although it falls short of a common service" (Q. 1143).

28. The Electronic Engineering Association confirmed that rationalisation of inspection procedures "is going along the right paths" (Q. 1370), but felt that a single inspectorate would be "a very desirable step" (Q. 1363). When a firm is producing equipment which might be sold to three different customers, each with a different inspection procedure, it is difficult for the firm to train its staff in three different methods (Q. 1364). Your Committee accept that recent measures taken have lessened the danger of duplication of effort, but they consider that unification should be pursued. Qualified support for this view was given by the Treasury who felt that "there is certainly a case for a measure of unification here" (Q. 1587), although they felt that the problem was difficult and likely to take some time to resolve (Q. 1590). The Ministry of Defence, however, regarded it as the first priority of the Defence Inspection Committee to "see that the functions of the present inspection service are co-ordinated, that there is elimination of duplication between them, that they adopt common practices, common documentation, and so forth" (Q. 1690). They regarded a common inspection service as "something which might well come, indeed it might be the fall-out from the working away at co-ordinating their practices" (Q. 1691). This is, in the view of Your Committee, the wrong approach; co-ordination of practices is certainly desirable but it would be brought about much quicker by the establishment of a common service, which, in itself, would be an incentive to achieve co-ordination with the minimum delay. Your Committee are concerned in this Report only with electrical and electronic equipment for the Services; the problems of a common Inspectorate go much wider than this. Nevertheless the establishment of a unified Ministry of Defence working closely with the Ministry of Aviation should lead to greater rationalisation generally and a common inspection service would be a valuable step along the road to integration. Your Committee recommend that a common electrical and electronic Inspectorate should be established for the Defence Departments and the Ministry of Aviation, and that consideration should be given to extending this to other fields.

¹ Evidence, p. 6.

THE SYSTEM IN PRACTICE

Introduction

29. Your Committee have, in the previous paragraphs, described the general principles governing the decision to order a piece of equipment and the various stages through which the equipment passes before it is finally handed over to the Service Department concerned. They now turn to an account of the history of a particular range of equipment and the proposed developments for its future. They have chosen the field of manpack wireless sets for the Army because this is comparatively simple to understand, and because they consider that the lessons of the past have only partially, if at all, been taken into account in planning for the future.

Manpack Wireless Sets from 1941-1965

30. A brief description of all the manpack wireless sets used since 1941 was supplied to Sub-Committee C by the Ministry of Defence (Army Department)¹. The main sets used by infantry for short distance communications after the war were the 31 and the 62. The former, a very high frequency set weighing about 23½ pounds, came into service in 1949 and is still used by the Territorial Army and Cadet Forces. The 62 set is a high frequency type weighing about 59 pounds, which came into service in 1944-45, and is still in active use. In fact the 62 set was described by one witness as being still "used in Malaysia to this day, but only just" (Q. 348). Your Committee were amazed to discover that British forces on active service in the Far East were having perforce to use a wireless set which has been in service for over twenty years. It is moreover, a set which was designed "for mules and also for vehicles" (Q. 348), and which is extremely difficult for any soldier to carry, let alone one struggling through jungle conditions in Malaysia. Your Committee sought to ascertain what efforts had been made to avoid this deplorable situation.

31. The VHF 31 set was replaced in about 1959 by the A 41 which is now the standard set for use by infantry at battalion and company level. The 31 set was thus in general use for only about ten years, which may not be considered excessively long, although Your Committee note that the date of the operational requirement for the A 41 was February 1953, and the set did not come into service until 1959, which suggests some delay in production. The situation with regard to the HF sets is far more serious. It is a well established fact that, although VHF is now normally used, there is an operational necessity to use HF under certain conditions; for example in the jungle the screening of the wet trees prevents VHF communication to stations outside the area (Q. 314). Such conditions prevail in Malaysia and in the Far East generally, where British Forces have had an operational commitment for many years now. It appears obvious, therefore, that a replacement for the 62 set, which was both old and unsuitable because of its weight for jungle conditions, should have been treated as a matter of urgency some time ago.

32. The replacement for the 62 set, the A 13, is now just beginning to come into service² (Q. 319-20). It has a much greater range than the 62 set, and is less than half the weight, so it is clearly far better for operational

¹ Appendix 3, pp. 264-265. ² Appendix 3, p. 265.

use. What is important about the A 13, however, is not its efficiency, which Your Committee do not dispute, but its amazingly late appearance on the scene. The War Office operational requirement for the set was not produced until August 1961,¹ when the 62 set had already been in use for sixteen or seventeen years and its obsolescence could have been in no doubt. Indeed in the operational requirement it was clearly stated that the A 13 was required for service in 1963/64 and that the existing HF sets were out of date and would not meet the requirements of 1965.² In practice, as has been seen, the A 13 has only just started coming into service, so that there has been a delay of one or two years in which, by the War Office's own admission, out-of-date equipment has been used; Your Committee believe that the period of delay may have been much longer.

33. There does appear to have been some awareness in the War Office that the 62 set was obsolete and unsuitable for use in the Far East. As can be seen from the Ministry of Defence (Army Department) Memorandum, in 1955 a limited number of 750 A 510 sets were purchased from Australia. This set is a good deal lighter and smaller than the 62 set, and had been found by the Australians to work well in the conditions prevalent in the Far East (Q. 348). It was admitted by witnesses that it had been bought as a stopgap (Q. 343, 348). Your Committee accept that it may have been necessary in 1955 to buy a set already in production and of proved ability, if there was no British HF set available. Unfortunately the 1955 purchase was not the last occasion on which the War Office were forced to buy from abroad. In 1964, nine years later, a further 250 A 510 sets were purchased from Australia.³ By this stage the A 13 was being designed, and the purchase of 510 sets was strictly limited (Q. 348). While, however, in 1955 the 510 may have been a useful and up-to-date set, in 1961, when the operational requirement was the A 13 was produced, it was admitted that it, like the 62 set, was out of date;⁴ three years later, however, the Army was being compelled to buy a few more of these sets for want of anything better.

34. It is clear from the account given in the preceding paragraphs that, in conditions where HF sets need to be used, for many years British troops have been compelled to use unsuitable and out of date wireless sets. What is not so clear is why this situation was allowed to develop. The original HF set in use after the war had come into service some five years before its VHF equivalent, yet the HF replacement was not sought until 1961, eight years after the requirement for a new VHF set and two years after it actually came into service. It is known that HF sets take longer to produce than VHF sets and require more research and development (Q. 342). Your Committee can conceive of only two possible reasons for the delay in the production of the A 13 set. Either the initial stages of research and development of it took an inordinately long time, or the War Office believed that the VHF A 41 set might prove adequate for all conditions and there was no need for a specific HF replacement. Whatever the reason may have been, the story is one of inadequate planning which must have affected the efficient carrying out of their duties by British soldiers.

¹ Appendix 3, p. 265. ² Evidence not reported. ³ Appendix 3, p. 265. ⁴ Evidence not reported.

The Hobart Plan

35. The recent history of manpack wireless sets has been one of confusion and delay ; Your Committee sought to ascertain whether future plans offered more hope of achieving co-ordination. At first sight it would appear that more positive planning is taking place. On page 49 of the Statement on Defence, 1963,¹ there was set out the blueprint for the future. "A new system of radio communications known as the Hobart Plan is now under design study. Hitherto our signals equipment has generally been developed in response to individual needs rather than as a whole. This has produced a diversity of equipment which creates problems of operation, control and maintenance. The Hobart Plan embraces the whole range of field army signals from the complex exchange at headquarters to the smallest manpack radios in forward units, and the aim is to rationalise and integrate the new generation of radio equipment." This is an admirable concept, especially in the circumstances of 1963 when the War Office were about to purchase an out of date Australian wireless set for want of an up to date British equipment. Your Committee enquired how far the ideals of 1963 had been realised in 1965.

36. The Hobart system will consist of three separate sub-sections. There will be the main trunk communications system, known as Allerton, which will operate from the highest formation down to brigade level ; a second sub-section, known as Boxford, will give single channel access to an independent unit to the trunk system ; the third sub-section, known as Clansman, is the net system providing communications forward from brigade right down to the front line (Q. 193). The cost of the Clansman system was estimated in February, 1965, by a witness from the Ministry of Defence (Army Department) to be about £90 million, spread over several years ; a very rough estimate of the cost of the trunk system would be £50 million (Q. 190). Before considering the possible future of the trunk system, Your Committee enquired into the progress of the Clansman system, which contains the sets which will succeed the A 41 and A 13 sets which they have already discussed.

37. The Clansman system is designed to contain some seven or eight sets to replace the far greater number in existence at the moment (Q. 331, 345). The A 41 will be replaced by a VHF set known as the 1202 (VB), planned to come into service in 1972² (Q. 325-329). The HF set, the 1221 (HB), which will replace the A 13 set, is not expected to be in service until 1974 or 1975 (Q. 325, 330-331). Both these sets will be lighter than the existing sets, and will have a greater range ; most important of all, perhaps, they are designed to meet inter-Service requirements (Q. 196). From a study of the staff requirement for both the 1202 (VB) and the 1221 (HB), Your Committee are satisfied that the Clansman system will represent a considerable improvement on the signals equipment in use at present, and should prove satisfactory, provided that it comes into service in time and that its cost is not excessive. It is these factors which cause Your Committee some concern.

¹ Cmnd. 1936.

² Appendix 3, p. 265.

38. On the 24th February, 1965, Sub-Committee C were informed by a Ministry of Defence (Army Department) witness that the Clansman system had undergone its project study and was about to go up to the Operational Requirements Committee (Q. 195). On the 25th May a Ministry of Aviation witness stated that the Weapons Development Committee had approved the project, "and we are now in the process of formulating and placing the individual contracts for the development of the various net radio equipments" (Q. 1195). On the 23rd June, however, the Electronic Engineering Association pointed out that the Clansman project had been on the stocks for some four years, and that a development contract had still not been issued. Feasibility studies had been undertaken, involving quite considerable teams which had been left "in suspended animation waiting agreement for the next phase" (Q. 1316). The Association had been compelled to write to the Permanent Secretary at the Ministry of Aviation about the delay, and particularly its effect on future exports (Q. 1319). Your Committee consider the whole question of exports at some length later in their Report; at this stage they are concerned with the effect of the delay on the effectiveness of the British troops which will use the equipment.

39. The reasons for the delay in proceeding with the Clansman project were explained to Sub-Committee C by a witness from the Ministry of Aviation. The original estimate for the cost of the scheme had been about £90 million. When the results of the project studies on the various sets needed had been evaluated, it was discovered that "both the development costs, as then estimated by our contractors, and even more important, the unit production costs of the resulting development, aggregated a sum which was very significantly greater than the sums which we had had in mind when we were evolving this concept" (Q. 1630). In money terms the cost of the Clansman scheme, as originally evolved, would have risen from £90 million to over £150 million (Q. 1631). As a result of this discovery, a reappraisal of the whole project had to be made, which accounts for the delay in proceeding. It was decided that it was not possible to allocate sufficient money to meet the original concept of the project. There were, therefore, three alternative solutions; to relax the requirements for the various sets, to cut out some sets entirely, or to reduce the number of sets actually produced. In the event, it was decided to maintain the quality of the equipment, but to dispense with some of the array of equipments and to reduce the number of equipments produced (Q. 1630). By this means it is hoped that the eventual cost will be brought back to something like the £90 million originally estimated (Q. 1631).

40. In the circumstances Your Committee do not dissent from the decision taken, which appears to be the least of the possible evils. The story of the Clansman project, however, shows very clearly how unrealistically optimistic was the statement about the Hobart Plan in the 1963 Defence White Paper already quoted. On one section alone of that plan there have been grave difficulties, and it would have been far better to have waited to see how plans developed before pronouncing on their merits. The Clansman

project also illustrates clearly both the strength and the weakness of the present procedures described by Your Committee in the earlier paragraphs of their Report. It is certainly true that the rapid rise in the cost of the project has been spotted at a fairly early stage before vast amounts of public money have been expended, and this is to be welcomed. On the other hand, the original estimate of £90 million has been shown to have been a bad miscalculation, and as a result the timetable has very naturally had to be delayed while recalculations are made. Your Committee hope that future improvements in the procedures will to some extent prevent a recurrence of cases of this sort.

41. In the meanwhile, however, it is essential that work on the revised Clansman project should go ahead without any delay. The A 41 set, for example, must be replaced by 1972; it will then have been in service for thirteen years. In their staff requirement for the 1202 (VB) set the Ministry of Defence (Army Department) stated that the A 41 will have reached the end of its useful life by 1969-70.¹ In the timetable for a future project produced by the Ministry of Defence, the estimated time from the placing of the development contract to the beginning of production deliveries was seven years.² If that is typical, the A 41 replacement, even if the development contract were placed now, would not come into service until the summer of 1972, and possible snags could hold it up still further; in the light of experience to date, such snags are more than a possibility. A Ministry of Aviation witness thought that the production date might be around about 1970, but stressed that, as serious development in the sense of actual engineering design had not yet begun, "I would not like to be pinned down on this" (Q. 1638). Your Committee accept the need for careful examination of the project, but it is essential that there should be no repetition of the muddle and delay which occurred over the A 13 set, and that British troops should be given up to date equipment. They recommend that the development contracts for the Clansman sub-section of the Hobart system should be placed at once, and that every effort should be made to produce the replacement for the A 41 set before 1972.

42. Your Committee turn now to the other main feature of the Hobart Plan, the proposal for a main trunk communications system. On this they are unable to be so precise as in the case of the Clansman project, since much of the evidence on the subject is regarded as of a confidential nature. The trunk communications system is planned to come into operation later than the Clansman sub-section; a Ministry of Defence (Army Department) witness described the project study as "still some way from completion" (Q. 190). An Electronic Engineering Association witness, who described Clansman as being in suspended animation, said that the Allerton/Boxford system for trunk communications "is even more suspended, it is further away" (Q. 1319). Your Committee were naturally concerned with the delay, but from evidence which they have received in confidence from the Ministry of Aviation, they consider that there may be good reasons for some delay at the present time, however annoying it may be to the electronics industry, and that certain discussions now in progress could have

¹ Evidence not reported. ² Appendix 2, p. 263.

fruitful results which would justify the present hold-up. Your Committee do not dissent from the present arrangements being made by the Ministry of Aviation.

43. Where Your Committee have anxiety, and where they differ to some extent from the Ministry of Aviation and the Ministry of Defence, is over the question of whether the Allerton system, in whatever form it may appear, will already be out of date. It is hardly likely to be in operation before the late 1970's and Your Committee regard it as highly probable that by then communication techniques, which have been advancing at a staggering rate in recent years, will have reached such a level that what may be called conventional methods of communication will be obsolescent. In their initial examination of Ministry of Defence witnesses, Sub-Committee C enquired what study had been made of the possibility of using space satellites for military communications. They were informed that a project study was in progress, as a result of which within two years perhaps it would be known whether satellites might be used (Q. 154-155). Figures had been put forward of the cost of such a plan, but, as one witness said, "How much one believes the figures is another question" (Q. 163). One of the problems stated to be of importance was that the needs of military communications were different from those of civil communications (Q. 166).

44. At the time Sub-Committee C held their final examination of departmental witnesses, a rather different attitude was discernible. Both the Ministry of Aviation and the Ministry of Defence pointed out that the Hobart plan was essentially for a tactical communications system, whereas any consideration about the use of satellites was at present confined to strategic possibilities (Q. 1639, 1695). In the strategic field Your Committee are glad to note that study appears to be now rather further advanced. Although no long term policy has been formulated on the use of communication satellites for defence purposes, negotiations with the Americans have reached an advanced stage for the participation by the United Kingdom ground stations in trials of an experimental satellite system for defence which the Americans intend to establish early next year. "This is known as the interim defence communications satellite project" (Q. 1694). A Ministry of Aviation witness confirmed that, subject to economics, for long distance communications, such as, for example, between London and Singapore, the obvious channel is satellite telecommunications (Q. 1639).

45. Your Committee do not consider that there should be a rigid distinction drawn between the strategic and tactical use of satellites for communication, particularly when planning at least ten years ahead. On this there appears to be a difference of approach between the attitudes of the Ministry of Defence and the Ministry of Aviation. A Ministry of Defence witness thought that the Hobart trunk scheme in its present form would go ahead, since the Americans were not contemplating abandonment of the basic concepts of this system in whatever they planned in the foreseeable future, "so that particular kind of fear is not one one need worry about particularly" (Q. 1697). A Ministry of Aviation witness, however, while doubting whether tactical communication by satellite would be feasible within the planned lifetime of the Hobart system (Q. 1639), conceded that

it might come "sooner than I would guess now" (Q. 1640). He admitted also that, of the three essential requirements needed by a satellite used for military purposes, namely mobility, anti-jamming capability and security, the latter two presented no intrinsic problem and it was really only the question of mobility which caused difficulty at present (Q. 1640); even this does not seem a really difficult problem. Unlike the Ministry of Defence, the Ministry of Aviation stated that the Americans were considering the use of satellites for tactical purposes (Q. 1643). Your Committee support the line taken by the Ministry of Aviation, and consider that the use of satellites for all military communications should be given much more serious consideration. It may be argued that it cannot come soon enough; such an attitude was commonplace only a few years ago about the possibility of men walking in space. It may be argued that it will be too expensive; the cost for the present Hobart plan is very far from negligible, as has been shown, and cost should be reckoned not merely in terms of actual expenditure but in terms of long term reliability and value for money. Your Committee recommend that the Ministry of Defence and the Ministry of Aviation should give early and thorough consideration to the possible use of space satellites for tactical as well as strategic military communications with a view to using such methods if possible in the trunk communications system planned for the Services.

AUTOMATION IN STOREKEEPING

General

46. Your Committee have so far in their Report considered the problems of producing electrical and electronic equipment; they turn now to the control and handling of such equipment once it is in service. By far the most important aspect of this is the use of automation. A computer is in itself a highly complex piece of electronic equipment, and it is also used by the Ministry of Defence as a means of handling and controlling the issue of stocks of electrical and electronic equipment. There are essentially two main types of computer, the process control type used, for example, by industry to control machines, and the office type, which is essentially a large and sophisticated calculating machine. It is with this second type of computer that Your Committee deal in this Report.

47. The division of responsibility between Departments in the ordering and installation of computers was explained in evidence to Sub-Committee C (Q. 1504-1523). In essence the user Department may decide there is a need for a computer, or there may be a suggestion from the Treasury O. and M. Division to the Department. A joint study team from the Department and the Treasury, together with the Technical Support Unit, formerly with the Treasury but transferred to the Ministry of Technology on 1st April of this year (Q. 1465), draw up a specification. The Stationery Office are then responsible for inviting tenders and arranging the contract details, and for the actual purchase of the machine. The overall responsibility for the use of computers in the Government service lies with the Treasury in their capacity as overseers of the general efficiency of the Civil Service. It is

perhaps too early to say what effect the removal from the Treasury of the Technical Support Unit and its transfer to the Ministry of Technology will have; at first sight the transfer appears to complicate the problem by involving yet another Department. In their Fifth Report in Session 1963-64¹ the Estimates Committee drew attention to the importance of the use of computers and urged the Treasury to instil into all Departments a proper appreciation of the immense potentialities of computers. A Treasury witness told Sub-Committee C in the course of the present enquiry that the Ministry of Defence were "computer-conscious in a pretty big way" (Q. 1513). Your Committee have considered at some length the use of computers by the Ministry of Defence and cannot entirely accept the view of the Treasury. A close study of the history and use of the three computers used to handle the technical and electronic equipment of the Services reveals a number of serious faults in the handling of what is admittedly a far from simple problem.

Costing

48. Members of Sub-Committee C inspected the computer installations at Donnington, Hendon and Copenacre. One of the purposes of installing a computer, though by no means the most important one, is to realise savings in both staff and expenditure. Your Committee were given detailed evidence about what had been achieved or what was hoped to be achieved in this field. At Donnington the I.C.T. 2400 computer has only recently been installed and is not yet in full service. The cost of the machine itself was £590,000, and the cost of installation £152,000 (Q. 509). At the time when Sub-Committee C visited Donnington there had been a saving of 50 staff representing an annual cost of £43,354 (Q. 517). It was estimated that when the computer became fully operational there would be an annual saving in money terms of £233,707, and in terms of staff 269 (Q. 525). It would thus appear that the computer should, if all goes well, pay for itself in slightly over three years.

49. At Hendon the cost of the A.E.I. 1010 Automatic Data Processing System is £881,117.² The estimated savings in direct costs are expected to be £100,000 a year (Q. 984). At the same time, however, the Ministry of Defence (Air Force Department) expect that there will be an indirect saving of up to £2 million a year. This is calculated on the assumption that there is likely to be a saving of at least 5 per cent on the £40 million spent annually on the purchase of maintenance spares as a result of more accurate data about past consumption and better utilisation of present available stocks (Q. 960-61). This is obviously to some extent a guess.

50. At Copenacre the EMIDEC 1100 computer was installed in 1962 at a total cost of approximately £435,000 (Q. 1241). The savings on the project were explained in full in a note by the Ministry of Defence (Navy Department).³ The many changes in the situation since 1962 have rendered it almost impossible to provide exact figures. The commitments of the Copenacre depot have increased greatly, so that in fact there has been an

¹ H.C. 1963-64, 228. ² Evidence, p. 219. ³ Appendix 4, p. 266.

actual increase in staff dealing with naval stores. However it is estimated that the annual saving comparing the present numbers with those that would have been needed under the old system has been about £20,000 a year. There has also been a saving on payroll tasks, which, when completely transferred to the computer, will yield about another £20,000 a year. There are also believed to have been considerable savings in reduced store holdings and storekeeping costs as a result of the introduction of the computer; the Ministry of Defence (Navy Department) could not give a realistic figure for this, but pointed out that whereas turnover in 1964/65 increased by about 25 per cent, the value of the stockholding at Copenacre fell by over 5 per cent.

51. It would appear at first sight from a study of the three systems that the Copenacre computer is the least successful in terms of savings achieved; indeed in direct savings, since much of its work will be taken over by a new computer in February 1967 (Q. 1526), it may well show a loss. However, Your Committee must point out that the savings quoted for the Donnington and Hendon installations are for the most part only estimates, which may not be realised. Furthermore, although the costing of the project is obviously important and although direct savings in manpower are desirable, there are other even more important aspects to be considered. One of these is clearly the obtaining of the right equipment at the right time; the story of the Hendon project serves as an illustration of this, and Your Committee have considered it in some detail.

The Computer at Hendon

52. A Memorandum setting out the history of the computer at Hendon was supplied to Sub-Committee C by the Treasury and the Stationery Office.¹ The initial scheme for a central record of R.A.F. stocks in all Supply Depots and Units was instigated in 1958. In September 1959 tenders for a computer installation for this purpose were sought from four manufacturers. In September 1960 a conditional order was placed with Associated Electrical Industries, and the order was confirmed on 1st June 1961 with an agreed delivery date of February 1962, later amended to April 1962. This target date was not met, and after a further target date of 31st January 1963 had also not been met the manufacturers were told that the contract would be cancelled if the equipment was not delivered satisfactorily by 31st May 1963. Despite this decision and the failure of the equipment to pass factory tests in May 1963, it was decided to try to complete the contract, and a further order for equipment was placed in October 1963, since it had been discovered that the original specification would have proved inadequate even if it had passed its tests. A further series of failures followed, but eventually the system passed all its tests and was finally accepted on 20th May 1965. A claim is now about to be made against the manufacturers for the delay in delivery and the inadequacy of the first equipment.

53. There are a great many important questions arising from this sorry tale of confusion and delay to which Your Committee sought answers. They first sought to determine why the contract was given to A.E.I. They were

¹ Evidence, pp. 218-219.

informed by the Controller of the Stationery Office that of the four firms originally asked to submit tenders, one, I.C.T., withdrew. The prices of the other three tenders submitted by I.B.M., A.E.I. and E.M.I. did not greatly differ. While the I.B.M. tender was ruled out on grounds of price, A.E.I. was preferred to E.M.I. for various technical reasons described in evidence (Q. 1461). On the face of it these reasons seem plausible, but Your Committee feel bound to point out that in fact the technical advantages of the A.E.I. machine did not initially produce the desired result, since their original equipment constantly failed its tests and considerably more equipment than was originally forecast turned out to be needed. Departments may argue, perhaps with justification, that the choice of any of the other firms would have led to even greater difficulties, but this argument only serves to strengthen the case for a far more careful assessment of the problems involved in a costly and unprecedented enterprise than appears to have taken place.

54. Whatever the factors influencing the decision to award the contract to A.E.I. may have been, it remains true that the original configuration tendered by the firm proved quite inadequate, and it became necessary to order additional equipment costing £247,119. Sub-Committee C sought to ascertain why it took so long to realise the need for this extra equipment. They were assured by the Commandant of the R.A.F. Supply Control Centre at Hendon that the specification presented to the firm "should have been sufficient to enable the size of the system to do the work to have been calculated" (Q. 976). It was the company which made a bad underestimate which they discovered when they came to write their part of the programme which controls the operations of the computer and its peripheral equipment (Q. 979). It is on this basis, no doubt, that the Government are claiming in respect of the inadequacy of the original equipment. Your Committee cannot, however, entirely absolve the Departments on this aspect of the affair. It seems quite extraordinary that it took over three years, from September 1960 when the first order was placed, to October 1963 when the supplementary order was put in, to realise that more equipment was needed, and a considerable amount more at that. The real trouble appears to have been that in an entirely new and complex field both sides worked quite independently, the Departments drawing up what they thought the specification should be, and the manufacturers putting in a tender which they thought would meet the case. It is for the Departments to suggest improved liaisons and Your Committee are glad to note that they realise they have been at fault. The Controller of the Stationery Office told Sub-Committee C that a new procedure was now in operation. There are preliminary talks between the experts on the Government side and the firm, a configuration of equipment is agreed and that is specifically put out to tender; this change "we feel is a very wise one" (Q. 1503). Your Committee agree wholeheartedly; they only regret that such an obvious step was not taken long ago.

55. The next problem which required clarification was to ascertain the reason for the complete *volte face* by the Departments in the summer of 1963. It had been clearly stated in January that the contract would be cancelled if the equipment was not delivered by 31st May; yet in October a contract for yet more equipment was placed with the same firm. As the Controller

of the Stationery Office described it, between May and October "there had been a good deal of coming and going about the equipment" (Q. 1473). It was finally decided as a matter of policy by Ministers to go ahead with the contract. Consideration was given to the possibility of starting afresh with a new contractor; a study carried out by the Treasury suggested that there would be little advantage in either time or cost in doing so. The estimated cost of starting again with another contractor was £850,000 (Q. 1477), and if that job had been carried out without snags, the computer might have been in operation about the end of 1964 or the beginning of 1965 (Q. 1478). No doubt Ministers in reaching their decision hoped that A.E.I. would still do the job cheaper and quicker; in fact the total cost of the A.E.I. installation is £881,117, and it was not finally accepted until May, 1965. Ministers may also have thought it desirable to encourage a British firm; this laudable aim has not been fulfilled since A.E.I. no longer develop data processing computers (Q. 1002).

56. The final question which Your Committee considered is the claim. They must be concerned with the general principle of the terms of the contract on this question. They were informed that a specific clause in the contract requires A.E.I. to pay $\frac{1}{2}$ per cent. per week of the cost of any equipment delayed by the fault of the contractor up to a maximum of 10 per cent. (Q. 1491). This means in practice that the most that could be obtained by the Government on this contract would be about £60,000 (Q. 1492). This Your Committee would regard as quite inadequate, should it turn out that the reason for the delay lay entirely with A.E.I. The contract in fact only took account of a possible delay of up to 20 weeks, whereas the actual delay has been over three years. A maximum of 20 weeks seems quite insufficient to Your Committee in the case of a contract for a computer, especially a new and sophisticated machine such as that proposed for Hendon where delays are highly probable. They note that a revised edition of the detailed conditions for tendering for Government data processing is now about to be agreed with the associations concerned, B.E.T.A. and E.E.A. (Q. 1504). Your Committee believe that it is right that any firm, if it has been entirely responsible for a delay in producing a computer, should bear the full financial responsibility for the delay. They therefore recommend that in the conditions for tendering for Government data processing it should be made clear that in future contracts the clause relating to claims for delay should contain no maximum limit.

The future programme for computers for the Services

57. Your Committee regret the delays and difficulties which the Hendon project has encountered because they believe that in essence the idea behind it is right, and that the then Air Ministry were more fully aware of the potential value and use of computers than the other Service Departments, although it may fairly be argued that they were perhaps too ambitious at the stage of computer development reached in 1958. The whole concept of the R.A.F. system differs fundamentally from that of the other two Services. Its basic purpose was explained in the original Memorandum submitted by the Ministry of Defence.¹ At Hendon there will be kept a central

¹ Evidence, pp. 14-15.

record of all stocks kept by R.A.F. units and depots. All transactions will be recorded, and a daily record will be kept of the size and location of all stocks on a world-wide basis. The advantage of this was explained at Hendon. Under the old system, once stock was issued from a depot to a unit, no further record was kept of it, so that when another unit required that equipment, a new piece had to be bought; when the Hendon computer is operational it will be known that the equipment wanted is at another station and may be available, in which case there would be no need to buy any more (Q. 961).

58. The installations at Donnington and Copenacre are much less sophisticated. The Donnington computer is designed solely to cope with the stores held in the depot, of which there are 262,000 (Q. 561), in addition to 4,274 equipments (Q. 563). There is a similar machine at another Ordnance Depot at Chilwell, which is completely compatible with the Donnington computer (Q. 531), but apart from that the task of the computer is entirely internal. The functions of the computer at Copenacre are rather wider, although it is far older than the Donnington installation. In addition to the tasks carried out at Donnington, such as stock control and calculations, keeping a record of all transactions and preparation of issue vouchers, the computer maintains a record of world wide Depot stocks of armament stores, and also undertakes preparation of the payroll for the civilian staff of the Navy Department who are paid monthly. It was admitted quite frankly at Copenacre that the computer was overloaded (Q. 1251). An additional commitment, other than the operational commitment, which will have to be undertaken is the Polaris range of stores. It has proved necessary to hire an interim I.C.T. machine to help with this load (Q. 1256, 1525).

59. From the description given of the three installations it is obvious that there has been a wide difference of approach by the three Service Departments. Your Committee accept that this may have been inevitable with separate Departments, bearing in mind the different times at which the computers were thought of. For example it might not have proved possible for the Admiralty in 1958 to envisage a centralised computer in the light of the existing knowledge of Automatic Data Processing in the country, although it is strange that the Air Ministry at the same time were planning the Hendon project. Perhaps the Admiralty were too cautious, but their computer at Copenacre was certainly operational well before the Air Ministry's. Perhaps the Air Ministry were too ambitious in the light of subsequent troubles at Hendon, but their installation now installed is certainly the most sophisticated. Differences of approach in the past may have been necessary, but Your Committee consider that the time has now come for the Ministry of Defence to examine the use of computers as a whole.

60. This unfortunately the Ministry of Defence do not appear to be doing. The future plans for Copenacre illustrate their approach very clearly. As has already been stated, the present computer is overloaded, and a machine is having to be hired as a temporary expedient to help with the Polaris programme. A new computer has therefore been planned for Copenacre, which it is hoped will start taking on work by February, 1967 (Q. 1526). Although it is intended at a later stage to use data transmission links similar to those

used at Hendon to link Copenacre with other depots connected with Polaris (Q. 1530), there is no possibility that this machine may be used in an integrated scheme involving the other Services or other Navy depots (Q. 1529). The reason given was that there was not time to plan such a scheme and still fit in with the Polaris timetable (Q. 1528). Your Committee regret that this should be so, but they regard it as inevitable that such rushed decisions will have to be taken so long as the Ministry of Defence continue to adopt their present attitude towards the use of computers, which is to wait until they see what they think is a requirement, and then set about installing a computer for that particular task on a piecemeal basis.

61. The Commandant of the R.A.F. Supply Control Centre, Hendon, informed Sub-Committee C that both the Navy and the Army were interested in the Air Force system (Q. 1022), and he felt that in the case of technical, including electronic, items of stores, "the adoption of a system comparable to ours or the integration of the Army and Navy ranges with our system would both be desirable and a profitable exercise" (Q. 1021). Your Committee agree that this argument needs serious and positive consideration by the Ministry of Defence. At present, however, the steps taken by the Ministry of Defence in regard to computer planning are limited to co-ordination. There are in existence two bodies, the Defence A.D.P. group, consisting of the heads of the A.D.P. branches of the Service Departments who exchange information and attempt to co-ordinate requirements, and a high level Defence A.D.P. Steering Committee, established in June, 1965, to assist the group in the co-ordination work (Q. 1668). It is now realised that present-day computers can cope with not only one area of management but several of a similar nature and consideration is always given to buying such a computer system whenever a proposal for purchase is contemplated (Q. 1669). This is a step in the right direction, but not, in the view of Your Committee, a sufficiently long one. One of the features of certain modern computers is compatibility. This factor, together with the existence of a unified Ministry of Defence, could and should enable computer planning to be considered as a coherent whole. At present there are 18 computers in existence within the Defence Departments, and 19 further projects are under study. A vast range of different sizes, ages and makes of computer renders comprehensive management impossible, but only by such comprehensive planning can defence equipment be organised on a modern basis. Your Committee recommend that the Treasury and the Ministry of Defence, with the assistance of the Ministry of Technology, should now plan an integrated computer system for operation within the Defence Departments by 1970 at the latest using compatible installations capable of meeting the requirements of all three Services.

Programming

62. Your Committee wish to stress that, important as the proper choice of a computer may be and vital though it is to increase the use of such machines, it is equally essential that the machines be properly utilised; in other words, to use the current jargon, the "software" is as important as the "hardware". Sub-Committee C made enquiries, therefore, about the qualifications of the staff employed on the computer installations in use

and the training they received. At both Donnington and Hendon a mixed team of military and civilian personnel are employed as programmers; the civilians are Executive grade civil servants, the military are officers of the Royal Army Ordnance Corps or the Equipment Branch of the Royal Air Force (Q. 542-3, 1011, 1014). At Copenacre the staff are all civilian, the programmers again being Executive grade civil servants (Q. 1295). So far as training is concerned, the practice appears to be to give a short initial course within the Department, followed by a short course with the manufacturer (Q. 1009, 1295). Courses are also run by the Treasury O. and M. training branches both for systems analysts and programmers, and A.D.P. appreciation courses are run for senior officers. At the present time some 75 per cent of basic training for analysts and programmers for the Army and Navy is provided by the Treasury; for the Air Force, who have greater training facilities, the proportion is much lower, amounting to only 17 per cent of their requirement for systems analysts and only 2½ per cent of their requirement for basic programmers (Q. 1536).

63. Your Committee are concerned that the present arrangements might not be sufficient to ensure that the standard of programming is sufficiently high. In particular they question the wisdom of using military personnel for programming duties. It was stated at both Hendon and Copenacre that it took at least a year to produce a really adequate programmer (Q. 1010, 1296). At Copenacre the witness went further; it would not be for about two years that a programmer could start to re-organise a major programme, and, he added, "we would not think that a programmer should be on the job for less than about four years because one would not gain the full benefit from him" (Q. 1296). The civilian programmers at Copenacre, with one exception, have been with the project since its inception (Q. 1297). The average tour of duty for a military officer on the other hand is between two and three years (Q. 576), although it was later stated by a witness from the Ministry of Defence that the Royal Army Ordnance Corps, for example, give their computer programming staff as long a tour as civilians (Q. 1671). If this cannot be generally accomplished however, and there are many factors which make longer than average tours of duty difficult to achieve for military staff, it may well be that for so much as half his tour of duty a military officer cannot be expected to pull his weight properly as a programmer. The standard reason given by the Army and Air Force for the use of Service personnel in store depots in this country is that it is necessary to train them there for possible operational duties overseas where civilians cannot be used. Whatever the validity of this argument for personnel employed in general stores duties, there seems no justification at all for extending it to computer programming. However sophisticated computer techniques may become with the advent of micro-electronics, it is hard to visualise accounting machines of the Hendon type being used in an operational situation. The Ministry of Defence also pointed out that the use of military personnel on computers was linked with the general use of military personnel on stores management. This has some validity, and Your Committee in another Report on military equipment consider the whole question of stores management by civilians or servicemen. They do not consider, however, even if military personnel

are retained in stores depots, that it is best to use them on actual programming, although clearly they would have to have a general awareness of the functions of the computer. Your Committee therefore recommend that the employment of military personnel as systems analysts or programmers at computer installations should be discontinued.

64. The quantity and quality of training in general for computer analysts and programmers is something with which Your Committee are concerned. They note the evidence of one witness that expertise "has to be acquired the hard way on the job once the chap concerned has learned the basic rudimentary rules of the game" (Q. 1295). Clearly no amount of theoretical training can be an adequate substitute for practical experience; equally, if the policy of buying different machines from different manufacturers continues, some form of course given by the manufacturer is essential. At the same time, Your Committee doubt the wisdom of having separate training done by each Service; this is not a matter in which one Service needs a different technique from another, indeed, it is common to the whole Government service. They note with some concern that at none of the computer installations visited was any mention made of the central training provided by the Treasury; it was not until evidence was received from the Treasury that the present extent of central training was revealed. Your Committee believe that, with the growing awareness of the potentialities of automation and its increased use throughout Government Departments, the need for more extensive centralised training will increase. This is not a problem peculiar to the Defence Departments, but they will be largely concerned with it. It is for the Treasury to stimulate a greater awareness of computer techniques; it is equally their responsibility to ensure that those who use computers use them to the full. It may well be that a Government computer training centre should be established; certainly this possibility should be examined. Your Committee recommend that the Treasury should examine with the Ministry of Defence the whole problem of training staff in computer technology, with a view to further centralising and increasing the present training facilities.

Conclusion

65. Your Committee have examined the whole problem of automation within the Services in some detail. They believe that it is right to do so, since this is perhaps the most important factor affecting future development of management techniques. They would agree to some extent that the Ministry of Defence are computer-conscious, but as has been shown, they are not so certain that this consciousness is along the right lines. They have found a tendency, which they feel is common throughout the country, to regard computers both as status symbols and as panaceas. Automation is not a gimmick; nor is there anything magical about it. Properly utilised, it can be of inestimable value as a tool of management; improperly utilised, it is nothing better than an expensive white elephant. At all times it presents a challenge; this challenge must be met by the Ministry of Defence and the Treasury by forward planning as a whole, not by waiting until particular needs have to be met; it is then too late.

CODIFICATION, STANDARDISATION AND RATIONALISATION

Inter-Service Standardisation

66. As a necessary adjunct to the integrated use of automation by the Services and as a useful means of more efficient provisioning arrangements Your Committee considered the question of codification and standardisation of equipment. This is a problem not confined solely to electronics, and affects a whole range of Service equipment. So far as electronics are concerned, however, the magnitude of the task can be judged from the fact that the Army have about 140,000 electronic items in current use (Q. 564), the Air Force about 150,000 (Q. 744-745), and the Navy just under 140,000 (Q. 777), making a total of about 430,000 items. This represents quite a considerable portion of the total number of over two million items in use in the armed forces (Q. 1592, 1689). When codification and standardisation has been completed, however, according to witnesses both from the Ministry of Defence (Q. 172) and the Treasury (Q. 1592), it should result in considerable savings, and Your Committee investigated the methods by which the Departments were attempting to achieve this result.

67. In the electronics field there are at present two main agencies responsible for codification, the Royal Naval Codification Agency and the United Kingdom Central Codification Authority. The Royal Naval Codification Agency deals with items for which the Navy is the production authority (Q. 1284). The U.K.C.C.A. is at present run by the Ministry of Aviation and similarly deals with items procured by that Ministry. Outside the electronics field there are other Service codification authorities. On the 1st October, 1964, with the agreement of the Treasury (Q. 1592), a senior retired officer was appointed by the Ministry of Defence to the new post of Inspector General of Codification and Standardisation (now, for some obscure reason, renamed Director General of Supplies Co-ordination), "broadly speaking to stimulate the work of codification and the work of standardisation" (Q. 171). The Director General is Chairman of the Defence Codification Committee, on which are represented all the various codification authorities (Q. 1279). He has now been in office for a year, and Your Committee sought to ascertain what he had achieved to date.

68. The most noticeable change which has occurred in the last year has been the marked increase in the number of staff employed by the codification authorities. In the section of the Royal Naval Codification Agency at Eastney which is responsible for codifying electronic items, the staff has increased from 6 in 1958 to 15 in June, 1965 (Q. 1284). In the Estimates for the current financial year the staff of the United Kingdom Central Codification Authority is to increase from 262 to 324 (Q. 1155). The Ministry of Aviation's Establishment Officer described the reasons for the increase quite frankly as an attempt to expedite the work of the Codification Authority. "If they carry on as they are carrying on at the moment they will not complete their jobs for years and years and years" (Q. 1156). In the seven years from 1958 the Naval Codification Agency at Eastney have codified some 28,000 or 29,000 items (Q. 1284). Your Committee accept that there is almost certainly a need for more staff but they do not con-

sider that this is of paramount importance. What is needed above all is not extra staff but concentration of effort by a unified authority.

69. Usually when questions of integration arise there are strong protests from the parties concerned who wish to preserve their separate identities, and this is often the excuse for considerable delay. In this case the excuse does not apply. The Ministry of Aviation pointed out that they only ran the U.K.C.C.A. as an agency for the Ministry of Defence (Q. 1154). The Establishment Officer told Sub-Committee C "I should be delighted to hand all this over to the Ministry of Defence. We have in fact offered this to them" (Q. 1156). In the light of this Your Committee can see no reason at all why the Director General of Supplies Co-ordination should not have made this his first and most urgent recommendation. He told Sub-Committee C that he was intending to "offer the codification service to the three Services" (Q. 1686), but although a common service might be possible, since the Services are responsible for their own management, he said "we have to be careful how we tread" (Q. 1686), and it would be better to concentrate on unified direction. The minor administrative difficulty that the Service codification agencies produce domestic catalogues as well as doing general work could easily be overcome, and Your Committee consider a central codification agency the first prerequisite for the rapid standardisation which is essential. Your Committee recommend that the United Kingdom Central Codification Authority should be transferred from the Ministry of Aviation to the Ministry of Defence and should take over all tasks at present carried out by individual Service codification authorities.

70. Your Committee consider that the magnitude of the task of complete codification and standardisation, which should be an incentive to speed, is in fact acting as a depressive, and that a greater sense of urgency should prevail. According to the Treasury the problem is "extremely complex" and "there is a very big task to be undertaken" (Q. 1592). A Ministry of Defence witness said "obviously this is not going to be done in a day. . . . It might take as much as five or six years" (Q. 1689). It appears obvious that no systematic programme or target date has been properly formulated. Although the task is large, there is a platform already in existence from which it can be launched. There is in use a N.A.T.O. codification system, and the ultimate objective is to apply this to the whole range of military equipment, both to items already in service and to new items coming into service (Q. 1686). Of the total number of items of just over two million about 600,000 are so far N.A.T.O. codified (Q. 1283). So far as electronics are concerned 50 per cent of the holdings of the Ministry of Defence (Navy Department) are N.A.T.O. codified, and in the field of common components the figure is nearer 75 per cent (Q. 1281). A Ministry of Aviation witness confirmed that, so far as electronics are concerned, "the tale is not as bad as it might be" (Q. 1157). In the light of this evidence, Your Committee feel that the task is not so far reaching as it might at first appear, and that, granted a dynamic sense of purpose and direction from above the backlog can be worked off, the task completed, and one further step along the road to integration accomplished. Even with the appointment of the

Director General of Supplies Co-ordination, the necessary drive does not so far appear to have been in evidence, though there are some signs of improvement. Your Committee recommend that the complete range of military electrical and electronic equipment should be codified to the N.A.T.O. system within the next two years.

Service-Civilian Standardisation

71. Almost as important as the question of inter-Service standardisation is the question of standardising the electronic components used in defence equipment with those used in civil fields. Indeed the Electronic Engineering Association regarded this as the more important field, confessing that they had not heard of the work of the Director General of Supplies Co-ordination (Q. 1380). The Committee on Common Standards for Electronic Parts under the Chairmanship of Rear Admiral G. F. Burghard, C.B., D.S.O., was established for the purpose of devising ways and means of bringing defence specifications into line with the civil specifications of the British Standards Institute (Q. 782, 1152, 1380). It has just made its recommendations to the Ministry of Aviation. The Electronic Engineering Association confirmed that they supported the principles of civil and military standardisation all along the line and asserted that as equipment manufacturers they were prepared to accept the recommendations of the Burghard Committee at once (Q. 1381). In the light of this and in view of the obvious importance of this subject, Sub-Committee C asked the Ministry of Aviation what steps they were taking to implement the recommendations. They were told that the Burghard Report was deliberately published in advance of Government decisions in order that the electronics industry could have discussions with their European counterparts about the possibility of a common approach (Q. 1664). After three months a meeting would be held with the interested trade associations to review progress and decide on a timetable (Q. 1665). A Ministry of Aviation witness told Sub-Committee C "I have some reason to expect" that the Ministry will agree to the principles of the Burghard Report (Q. 1664). Your Committee welcome this attitude, and trust that the discussions with the European electronics industry will prove fruitful. They recommend that the Ministry of Aviation and the Ministry of Defence should put into effect as soon as possible the recommendations contained in the Burghard Report.

Rationalisation

72. There is in existence in the Ministry of Defence a Steering Committee on Rationalisation, whose main function is to consider what administrative tasks might be done on a defence rather than a single Service basis¹ (Q. 175). Your Committee consider in another Report relating to non-warlike stores the whole approach of the Steering Committee, what has been achieved, and whether they are going about their task in the right way. In this Report Your Committee comment only briefly on the decision of the Steering Committee not to embark at once on a study of electrical and electronic equipment. The reason given was that electronics is a difficult subject "and we wanted to get our feet wet and do pilot studies

¹ Evidence, p. 2.

in the easier fields to start with" (Q. 175). This is an understandable attitude, but a mistaken one in the view of Your Committee. It is the very fact that electronics "is a vast range . . . more of a kaleidoscope than a stationary position" (Q. 1684) which makes it a challenge that must be met all the more speedily. The range of stores may be wide, but, as has already been shown, standardisation is far more advanced within that range than in other areas of military equipment. It was stated at Hendon that the management of electrical and electronic equipment requires far more sophisticated techniques than those applying to tables and chairs (Q. 1020-21). Your Committee recommend that electrical and electronic equipment should have the first priority in any new study undertaken into the management of stores for the Services.

INTERDEPENDENCE AND THE PURCHASE OF FOREIGN EQUIPMENT

General

73. In recent years the growth in the range and complexity of military equipment has caused Government Departments to realise that it would be difficult, if not impossible, for all the equipment needed to be produced in this country. There are then two main possibilities open to Departments; they can either do a straight purchase from another country, or they can go in for a policy of interdependence, that is of joint production with one or more foreign countries of a particular item (Q. 78). Both these policies have been adopted recently. Your Committee wish to state clearly at this stage that they do not disagree in principle with such a practice; indeed in many cases it is clearly both economical and sensible to have the option of buying abroad or of sharing the cost of development and production. At the same time, the purchase of foreign equipment naturally causes anxiety to the electronics industry in this country, and Your Committee were anxious to enquire into the factors governing such a decision in general as well as to consider certain recent examples which have caused concern.

74. The reasons for buying abroad were described in general terms by a Ministry of Defence witness (Q. 78). Sometimes only a small amount of equipment is needed which would be expensive to develop but comparatively cheap to purchase off the shelf abroad. Sometimes part of a complicated system may take too long to develop, and could be obtained quicker elsewhere. At other times an equipment developed in this country works badly, so that it is necessary to go abroad to get full value. Finally, and perhaps most frequently, a sudden requirement occurs, and there is simply not time to develop the equipment in this country. A Treasury witness, while confirming that these factors had to be taken into account, stressed that on the other side consideration had to be given to the short term costs in foreign exchange of buying abroad, and the need to encourage British industry. "It may be right to accept rather high costs for the current generation of equipment if there is a prospect that by so doing you will keep your industry going in a valuable line of development in which they may become competitive later" (Q. 1552). Your Committee agree that all these

considerations must be borne in mind. They now turn to the particular cases on which they received representations from the Electronic Engineering Association.

Electronic Equipment for the Phantom and Hercules Aircraft

75. Rather over a year ago the decision was taken to buy the Phantom fighter aircraft from the United States for the Royal Navy. More recently it was decided to buy the Phantom for the Royal Air Force in place of the cancelled P.1154 (Q. 1166). At the same time a decision was taken to buy the American Hercules transport aircraft in place of the cancelled HS 168. These are high level policy decisions, with the wisdom of which Your Committee are not concerned. It is, however, right for them in an examination of electrical and electronic equipment to ascertain how much, if any, British electronic equipment is to be purchased for these American aircraft when they are in service with the Royal Navy and the Royal Air Force. In the case of the Hercules, the production of the aircraft is almost complete, and it was stated by a Treasury witness that it would not be possible to get any British equipment into the aircraft in time, because to stop the production line would be vastly to increase the cost of the aircraft (Q. 1552). The situation with regard to the Phantom is rather more complicated, and was described in detail to Sub-Committee C by a Ministry of Aviation witness (Q. 1166-1186). The broad terms of the agreement between the British and American Governments envisage that up to 50 per cent of the work on the aircraft will be placed in this country and that the United States Government will use their good offices with the main contractor in the United States to ensure that this amount of sub-contracting is in fact effected (Q. 1180). The details of the proposed electronic fit have been discussed in both countries by joint teams (Q. 1167). One particular piece of electronic equipment will be specifically developed in this country; equally there are certain electronic equipments which must be British to ensure compatibility with the ground environment. On the other hand certain equipment is so integrated with the weapons system as a whole that it would be impracticable to substitute British equipment (Q. 1166). Between these extremes there are possibilities for the use of equipment provided by British industry "provided it can meet particularly the very tight timetable" (Q. 1552).

76. The main complaint made by the Electronic Engineering Association was about lack of consultation (Q. 1332-34). In the case of the Hercules they pointed out that the use of obsolescent American equipment by the British Services would gravely impede the chances of exporting current British equipment, since potentially interested countries would not believe that the Royal Air Force was not using the best equipment currently available (Q. 1331). Your Committee accept the force of this argument, which causes them concern. Unfortunately it is impossible to see how the use of British equipment in the Hercules could be achieved, once the policy decision has been taken to buy an aircraft, already nearing the end of its production line, for almost immediate use. It may well be the case that current British electronic equipment would be far better than the American equipment already installed; the questions of time and cost must also be considered, and these were factors

which influenced the decision to buy the Hercules in the first place. If the date of coming into service of the aircraft and its eventual cost were to be altered seriously for the worse, the original policy decision would become meaningless.

77. So far as the Phantom is concerned, the Electronic Engineering Association were anxious that American electronic firms might exert pressure on the manufacturer not to insert British electronic equipment ; they also pointed out that the provision for up to 50 per cent of the work to be sub-contracted in this country related to the engine and airframe as well as to electronic equipment (Q. 1331). A Treasury witness informed Sub-Committee C that the American Government had gone out of their way in the case of the Phantom to make it possible for British equipment to be installed (Q. 1559). Your Committee accept this view ; given the policy decision to buy the American aircraft, they consider that a sub-contracting provision for this country of up to 50 per cent is reasonable. Clearly it would be of advantage to the electronics industry to have a proportion of the 50 per cent guaranteed for electronic equipment ; the legitimate demands of the electronics industry, however, have to be balanced against the equally pressing claims of the engine and airframe manufacturers, who would doubtless protest if so much of the cost of the Phantom were to be spent on British electronics that it would be impossible within the terms of the 50 per cent agreement for the engine or parts of the airframe to be made in this country.

78. Furthermore, there is the question of additional cost to be considered. Your Committee asked the Ministry of Aviation about a report in a newspaper to the effect that the cost of each Phantom aircraft was likely to rise from £800,000 as originally envisaged, to almost £1 million, and that the increase was due to the decision to insert British engines and electronics. They are not concerned with the Phantom as a whole, but the possibility of a steep rise in the cost of the electronic equipment is a matter within their terms of reference. They were assured by the Ministry of Aviation that it was impossible to give a precise figure of the costs of the electronics, since final decisions had yet to be taken on certain items to be included. The additional cost, however, of including British electronic equipment or American equipment manufactured in Britain was reckoned by a Ministry of Aviation witness to be about £10,000 or £15,000 per aircraft (Q. 1659). Your Committee do not consider this excessive, bearing in mind the counterbalancing factors of the saving in foreign exchange and the encouragement to the British electronics industry, but the additional cost incurred serves as a warning of the difficulties of trying to include at short notice in a foreign aircraft too much equipment from this country.

79. Your Committee consider that the Electronic Engineering Association have a legitimate grievance over the period of notification they received in the case of the Phantom. The Association had no complaints to make about the treatment they received from the Ministry of Aviation after the decision to buy the Phantom was announced (Q. 1331). There is an obvious difficulty in this and similar cases, in that decisions of this sort to buy a foreign aircraft are often taken at comparatively short notice and usually necessitate a short period of time from the announcement of the decision until the equipment

is needed in service. This short period of notice invariably places the British electronics industry at a disadvantage in that it is extremely difficult for it to guarantee delivery of the equipment within the specified period. In the case of the Phantom the industry did not feel that it had been given sufficient notice. There seems to Your Committee to be a strong case for consulting the electronics industry at an earlier stage. However sudden a decision to buy foreign equipment may appear, it is clearly not unpremeditated and quite a considerable discussion goes on beforehand. It is at this stage that the industry should be consulted, told in confidence of the possibility of buying some foreign aircraft and invited to consider what they might be able to produce to go in the aircraft. If that were done, at least the industry would have a better chance to compete on equal terms with its foreign rivals. The Electronic Engineering Association have asked that if a decision is taken to buy the American alternative to the cancelled TSR-2, they should be brought in at a very early stage (Q. 1334). Your Committee consider that this should be done not only in this case, should it arise, but in any such similar circumstances, although they recognise the difficulties involved in keeping secret matters of policy. They recommend that, whenever the possibility of purchasing a foreign aircraft is contemplated, the electronics industry should be informed of the situation and given an early opportunity to produce equipment capable of inclusion in such an aircraft.

The Anglo-French Memorandum of Understanding of 15th May

80. Your Committee turn from the policy of purchasing foreign equipment to the policy of interdependence. There have recently been a number of joint Anglo-French projects for aircraft. In the civil field the best known is the Concord, and on 15th May, 1965, an agreement similar to that reached in the case of the Concord was arrived at between the British and French Governments to produce jointly a jet trainer and a variable geometry aircraft. The main principle of the agreement is that the development and production will be shared on a 50:50 basis with the French (Q. 1570-71). The Electronic Engineering Association complained that in the case of the Concord "the electronics were landed primarily in the French lap, perhaps almost by accident" (Q. 1338). They feared that the same thing might happen in the case of the military projects, and have asked the Ministry of Aviation to ensure that there is no repetition of the Concord affair (Q. 1338). The Treasury denied that the Concord agreement had been unsatisfactory (Q. 1572) and stated that in the case of the military projects it was too soon to think in terms of agreements about which country should get which piece of equipment since it had not yet been decided what the shape of the aircraft was to be or what it was to do (Q. 1570).

81. Your Committee take much the same view over the terms of the Anglo-French projects as they do in the case of the Phantom. It must be accepted that no joint project is likely to be envisaged by two countries such as the United Kingdom and France unless the development and production are shared equally; whether or not this is the most efficient method national pride would probably prevent either country from accepting less. It must equally be accepted that the engine and the airframe manufacturers must not be put in any worse position than the electronics manufacturers when it

comes to deciding how the 50 per cent of the work to be done in this country is to be allocated. The reverse of this applies equally, however, and Your Committee have some sympathy with the complaint of the Electronic Engineering Association that in the past at any rate electronics have been looked on as a subsidiary piece of the aircraft to be added at a later date ; "in a modern bomber or fighter the electronics can be 30 per cent of the aircraft and the system is, in effect built round the electronic capabilities" (Q. 1335). As the Treasury stated in the case of the two Anglo-French aircraft projects announced in May, it is far too early to start drawing up specific agreements as to where each portion of the aircraft shall be developed. On the other hand Your Committee do not wish to see an agreement announced at a future date allocating, say the engines to one country and the airframe to the other, with electronics to be settled later as a minor matter of rounding the total costs of both countries to 50 per cent. They recommend that, in the case of the joint Anglo-French projects for military aircraft signed on 15th May, the electronics industry should be consulted at the earliest possible stage of the discussions, and any detailed agreements as to allocation of work between the two countries should relate specifically to electronics as well as to engine and airframe.

EXPORTS

General

82. It is hardly necessary for Your Committee to stress the importance of exports. In this Report they are, of course, only concerned with the export of military electrical and electronic equipment. Even in this limited field, however, the importance of exports is paramount. As the Chairman of the Electronic Engineering Association told Sub-Committee C, "We are of course, an export minded industry with comparatively small home markets" (Q. 1389). The total amount spent by this country on the development and production of military electrical and electronic equipment is considerable ; the more that can be recouped by selling abroad the better. It is equally vital to preserve a flourishing and viable electronics industry in this country ; it could not survive merely by orders from the British Defence Departments, and it is the task of the Government to give the greatest possible assistance to the industry to sell abroad. Your Committee consider in this part of their Report the present role of the Government Departments and industry, and after dealing with various minor criticisms made by the Electronic Engineering Association they turn to the fundamental question of whether the present Departmental organisation is adequate for this important task.

The volume of exports

83. In a Memorandum to Sub-Committee C¹ the Ministry of Aviation attempted to give figures of the volume of exports of military electrical and electronic equipment in the past three years. It can be seen from the Memorandum that it is no easy task to give an accurate estimate. In their original oral evidence a witness from the Ministry estimated the value of

¹ Appendix 5, pp. 267-268.

defence electronic equipment exported in 1964 to be about £12 million (Q. 1219). This was based on Customs and Excise returns of goods declared as electronic equipments, and did not take account of electronic items incorporated in items such as ships, aircraft or guided weapons. The revised statistics produced by the Ministry of Aviation are based on the electronics manufacturers' returns of production to the Board of Trade. As can be seen from the figures the percentage of all electronic equipment which is exported has remained fairly constant at around 30 per cent., though in each year the actual value of goods exported has risen considerably. Of the total volume of goods exported it is estimated that rather under a third consisted of military equipment. Thus in 1964 £17.5 million of military equipment was exported out of a total export figure of £56.6 million, as compared with £12.0 million out of £40.3 million in 1962. While, however, there has been a general rise in the volume of military electronic equipment sold abroad, there has been no corresponding rise in the amount of equipment sold in N.A.T.O. countries; there the increase has been only marginal, from £4.4 million in 1962 to £4.6 million in 1964.

Departmental responsibility

84. The principle governing export of electrical and electronic equipment is that the actual sales are negotiated by the manufacturers themselves, and not by the Government Departments concerned (Q. 1197). Their role is primarily to assist British industry to export by various administrative measures, so that the staff engaged within the Departments in these matters are comparatively few. The Ministry of Defence (Navy Department) and the Ministry of Defence (Army Department) each have an organisation exclusively concerned with sales. The role of the central staffs of the Ministry of Defence in this field is to co-ordinate the work of these two organisations with that of the Ministry of Aviation and to organise the various committees concerned with the control of exports, where political, strategic and security, as well as commercial, factors have to be taken into account. This part of the central staffs also deals with collaboration in Research and Development with the other countries of N.A.T.O. The Operational Requirements Committee is charged with examining, among other considerations, the prospects of exports and the Weapons Development Committee invariably consider this aspect also¹ (Q. 70, 1443, 1574).

85. Within the Ministry of Aviation there is an organisation concerned more specifically with electronics. The Interdependence, Exports and Electronics Industry Division consists of three branches, one of which deals with export and interdependence in guided weapons and electronics; the total strength of this branch is 19 (plus clerical staff) of whom only about six are engaged full time on the export of electronics (Q. 1198). The functions of the branch were outlined by a Ministry of Aviation witness (Q. 1198) and amplified in a written Memorandum.² In brief, the branch acts as a bridge between industry and diplomatic and military representatives overseas, passing information from one to the other; it arranges demonstrations of equipment for potential buyers, either at home or abroad; it attempts to help industry

¹ Evidence, page 3.

² Appendix 5, page 267.

with problems such as getting security clearance, or export licence, or credit ; there may also be bilateral or multilateral meetings of military or technical staff at which information is exchanged, which might be of use in considering possible sales.

86. Your Committee have described the present organisation. A number of criticisms were made by the Electronic Engineering Association. Your Committee have considered these, and in many respects they share the view of the Association that there is room for improvement. At this stage they wish to point out that the Government themselves are clearly not satisfied with the present situation. On the 21st July the Secretary of State for Defence informed the House that " Sir Donald Stokes, the Managing Director of Leylands, has, with the agreement of his board, accepted an invitation extended to him by my right hon. Friend the Minister of Aviation and myself to advise us on the provision and exports of defence equipment, and on any changes of organisation that may be necessary for this purpose ".¹ Your Committee are, of course, gratified that this appointment has been made, since it appears to confirm some of the criticisms they have. On the other hand, it makes it more difficult for them to make specific recommendations in a field which is already being covered by Sir Donald Stokes. Nevertheless, they feel it their duty to report to the House the evidence they have received and the conclusions to which they have come in the hope that these, together with such suggestions as Sir Donald Stokes may make, will bring about an improvement in the important field of exports.

Government support for one particular firm

87. Before turning to the major question of whether the departmental organisation in its present form is sufficient to meet the needs of exports, Your Committee consider one or two smaller points. One matter on which the Electronics Engineering Association felt that a change of policy could fruitfully take place was the amount of backing given by the Ministry of Aviation to a specific firm. They had no complaints about the general level of support from the Government, except when two rival British firms were competing for the same order ; on such occasions " they always tend to stand back from the battle and leave it to the companies to sort out on its merits " (Q. 1421). This is in contrast to the attitude taken not only by the Americans (Q. 1422) who admittedly have a much wider field in which to operate, but also by the French (Q. 1423), who have a process of selection and then back their choice wholeheartedly. The Electronic Engineering Association felt that the British approach should be similar ; " we in industry have always said we would prefer what we call rough justice, a decision and action rather than no action " (Q. 1422).

88. The Ministry of Aviation asserted that there were no cases, at any rate so far as electronic equipment was concerned, in which they had stood back because more than one firm was involved ; they confirmed, however, that their general policy was to encourage all competing firms, and quoted two recent examples in which they had backed two firms, with apparent good results ; in the case of the potential Australian order " we gave the best impartial technical advice that we could, though we deliberately

¹ H.C. Deb. 1964-65, Vol. 716, c. 1560.

stopped short of giving them any specific recommendation as between the two alternatives" (Q. 1618). Witnesses from the Ministry were cautious about their ability to make a partial judgment, and stressed that true comparisons were rarely likely to occur. They did, however, concede that "If the case were put to us, and if the circumstances were such that there was an obvious advantage in our making such a judgment, I think we would make it" (Q. 1625). Your Committee agree that there may not often be occasions when the Ministry may have to make a decision. They do not, however, accept the argument that it is difficult for the Ministry to know what the customer really wants (Q. 1619). This is exactly the sort of thing a Government Department concerned with encouraging exports should know, and it is the task of our attachés in the country of the potential customer to help in assessing this information. They recommend that, where two electronics firms competing for a foreign order agree to abide by a choice made by the Ministry of Aviation, the Ministry should select the firm they think most likely to win the order and give it the full backing of the Government.

The Research and Development Levy

89. Another factor considered by the Electronics Engineering Association to be a hindrance to increased exports is the Research and Development levy. This is a charge fixed as a percentage of the selling price on any goods sold to third parties (Q. 1217). At present it is a fixed percentage. The Electronic Engineering Association asserted that the existence of any levy placed them at a great disadvantage *vis-à-vis* the Americans, since American firms are not called upon to pay any levy to their Government for development work done on behalf of the Government (Q. 1432). They also considered that if there were to be a levy, it would be preferable to return to the old system whereby the levy was agreed by negotiation between the contractor and the Ministry for each contract, thus allowing a measure of flexibility (Q. 1434). Although it might be possible with the present fixed rate to argue the case for some relief, in the words of the Association witness "you are liable as a first answer, to get a very dusty one, but you might by considerable pressure, be given some relief, but it might be too late by the time you have agreed this" (Q. 1435).

90. The reasons for the adoption of a fixed percentage levy were explained to Sub-Committee C by a Ministry of Aviation witness (Q. 1629). The argument for the change was made by the Select Committee on Estimates in their Second Report of Session 1958-59.¹ Up to then the Ministry of Supply, as it then was, had thought that there was advantage in delaying the settlement until more was known about the circumstances of each case. The advantages of a fixed levy "which is intended to do rough justice across the board and is not intended to be the right amount for each particular equipment" (Q. 1629), from the point of view of the manufacturer, are that he knows the situation from the beginning and knows how much to allow in quoting his overseas customers for this, and also that he can negotiate the rate downwards in a given case, whereas the Ministry do not reserve the right to negotiate the rate upwards. The advantages to

¹ H.C. 1958-59, 229, paragraph 31.

the Ministry of Aviation are that they do not have to negotiate the levy under pressure of time at the moment the contractor wishes to clinch the deal, and that the onus is on the manufacturer to justify a reduction in the rate rather than on the Ministry to prove the case for a particular rate of levy.

91. Your Committee accept the argument of the Ministry of Aviation to the extent that, if there is to be a levy, it should be fixed at an early stage, provided that some room for flexibility is left. They question, however, whether there is a case for retaining the levy at all in the case of military electronic equipment sold overseas. It is perfectly true that the Electronic Engineering Association were unable to estimate how many orders had been lost because of the existence of the levy (Q. 1436), but it clearly is a factor which might tip the scale. It is equally true that the levy brings a certain amount of money into the Exchequer, but the amount is in fact relatively insignificant. The amount received by way of Research and Development levy in the last three years was £295,000 in 1962-63, £420,000 in 1963-64, and £480,000 in 1964-65 (Q. 1218). A Ministry of Aviation witness admitted that there had been occasions when "the levy has resulted in a complete recoupment of our development expenditure, but I regret to say that those cases are the exception and not the rule" (Q. 1629). In the light of this, and in view of the paramount importance of increasing exports in whatever way possible, Your Committee consider that the British electronics industry should not be placed at a disadvantage in relation to their American competitors. They recommend that the principles of the Research and Development levy should be reviewed in relation to the exports of electrical and electronic equipment for the Services.

Changes in Departmental organisation

92. Your Committee now turn to the most important question of whether the present arrangements within the Departments described in paragraphs 84 and 85 are sufficient to ensure the maximum sale of electrical and electronic equipment abroad. They wish at the outset to make clear that neither they, nor indeed the Electronic Engineering Association, are making any criticism of the quality of the staff engaged on this work whether in the Ministry of Defence, the Ministry of Aviation, or overseas. The Chairman of the Electronic Engineering Association, speaking of the Interdependence, Exports and Electronics Industry Division of the Ministry of Aviation said that he had "nothing but the highest admiration for this comparatively small department which does what it can a little at the end of the chain to help us to export this military equipment" (Q. 1388). Speaking of the work of Government staff employed abroad, he felt that the situation "has improved enormously over the last few years, and is continuing to improve. There has been a complete changeround" (Q.1404). Your Committee welcome this evidence and in particular the suggestion that there has been a rapid improvement of late.

93. The Electronic Engineering Association made two principal criticisms of the present arrangements for encouraging exports. They asserted that the responsible people in the Ministry of Defence and the Ministry of Aviation were not sufficiently export-conscious, "What we would like to see is an

attitude of mind in defence from above which brings this exportability—this is a major problem—into prominence in the decisions that are made, to get people all thinking in this direction” (Q. 1401). If officials in the Departments were export-minded “this problem is half-way to being solved. But at the moment this is not so” (Q. 1395). The difficulty, in their view, lay not so much in the attitude of the people involved, but in their terms of reference. The primary task of the Ministry of Aviation is to develop the operational requirements of the Ministry of Defence; the primary task of the Ministry of Defence is to produce equipment for the British fighting Forces. Neither department has as their main responsibility the promotion of exports (Q. 1397). Linked with this criticism in the minds of the electronics industry is the feeling that even where Departments do attempt to consider the question of exports, the effort is made at too late a stage. As one witness told Sub-Committee C “this is not, first of all, basically a question of trimming a concept at some stage in development. It is at the operational requirements stage that this consideration must take place if you are really going to get highly competitive equipments. If you try and trim later on you get a half-way solution which is never good” (Q. 1403). Attempts to alter operational requirements at the stage of development tended to lead to time scale problems and a feeling that it was then too late (Q. 1400). In short the Electronic Engineering Association considered that they should be consulted from the outset in order to “bring industry’s market research knowledge, which is pretty considerable, to bear on the operational requirement” (Q. 1399).

94. The Ministry of Aviation and the Ministry of Defence answered the criticisms of the Electronic Engineering Association in no uncertain terms. The Ministry of Aviation stressed that they were very much export conscious, and to back this assertion a witness from the Ministry quoted the standing instructions of the Department: “Exports are vital to the economy of this country and have a high priority in Government policy . . . It is the duty of all members of the staff whether at headquarter establishments or out-stations to do everything they can in the course of their ordinary duties to help industry. In no case can a purely negative reaction be justified to an approach by industry” (Q. 1607). A Ministry of Defence witness also confirmed that it was not just lip service that was paid by the Ministry to the need to consider the possibilities of sale abroad (Q. 1447). The Ministry of Aviation went so far as to suggest that the blame lay with industry; the Ministry had constantly asked for suggestions to improve the export potential of equipment, but “Frankly, the response has been pretty poor so far” (Q. 1443). In so far as electronic equipment is concerned, within the recollection of a Ministry of Aviation witness there had not been a single example of a suggestion by the industry for modifications at the formative stage (Q. 1449).

95. As a natural consequence of their evidence about the response of industry, the Ministry of Aviation saw little value in there being a specific advocate of industry on the Operational Requirements Committee or the Weapons Development Committee. There would be difficulties in the attendance of a representative from industry, whose views can in any case be made known to the Ministry of Aviation members of the committees (Q. 1446-47).

The establishment of yet another organisation responsible for exports would be "a further complication on an already complicated organisational structure" (Q. 1451). When asked whether there was adequate machinery for utilising the knowledge of firms about export potential, a witness replied "We would hope, with the laudable interest that the electronics industry places on exports, that they will not hesitate to bring the export aspects of the thing fully to our attention" (Q. 1452). The onus would thus appear to be on industry to make the initial approaches and on the Ministry to listen sympathetically.

96. Your Committee agree to some extent with the views both of the Government Departments and the electronics industry. It may well be the case, as asserted by the Ministry of Aviation, that the response of industry to the request to submit suggestions for changes designed to give greater export potentiality has been disappointing. It may equally be true that, while the doors to the Departments are ever open for representations to be made, no initiative to get potential exporters inside those doors is made as a matter of course. The general attitude of Government Departments appears to be that they are more than willing to consider the potential exportability of equipment, provided that industry takes the initiative in suggesting it; if no suggestions come, the Departments must get on with their main task of producing for the British Services, and if it happens that the final product suits some other countries as well, so much the better. Your Committee agree that industry must press the Government all the time, but the process must be reciprocal. Departments must do more than invite industry to submit ideas for exports if it so wishes; they must encourage, cajole, and, if necessary, coerce. Your Committee do not consider that the present arrangements within the Departments lend themselves to the performance of the tasks that need to be done before a greater market for exports is forthcoming. They do not believe that it will ever be possible for a piece of equipment to be necessarily suitable for export as well as for home consumption unless there is in existence an organisation with no other function than to promote the sale of military equipment abroad.

97. The permanent organisation Your Committee have in mind will cover more than electrical and electronic equipment, but it is in this expanding range that the greatest possibilities lie. The organisation would have two main functions, to carry out the present tasks of the Interdependence, Exports and Electronics Industry Division of the Ministry of Aviation on a more extensive scale, and to present the case for exportability to the various committees which determine the type of equipment which is to be ordered. The exports organisation should be in the Ministry of Defence rather than the Ministry of Aviation, since it is there that the first staff requirements are formulated, and it is at that stage of thinking that the ideas for export must come. At the head there should be a fairly small but high level division, headed by a Chief Exports Adviser recruited from industry and a Deputy Under Secretary of State, and drawn equally from the Civil Service and industry.

98. The Exports Division would not usurp the functions of industry in carrying out actual sales, but their assistance would be readily available in bringing the full weight and influence of the Government to bear upon a

potential order. More important, however, representatives of the division would be seconded to the three Service Departments and would sit on the various committees responsible for drawing up the initial staff requirements. The Chief Exports Adviser and the Deputy Under Secretary of State (Exports) would become members of the Operational Requirements Committee and the Weapons Development Committee, with the sole task of advising, after consultation with industry, on the possibilities for export of a proposed requirement and recommending changes if necessary. Your Committee believe that, only when such high level representatives can put the case for exportability without fear or favour and without having to speak also for the needs of the Services, will there be more than a possibility that British electronics equipment of desirable quality will be deliberately produced to meet the needs of other countries without diminishing its value to the Services. They recommend that the Ministry of Defence should set up an Exports Division headed by a Chief Exports Adviser drawn from industry and a Deputy Under Secretary of State, with a view to the division taking over the present responsibilities of the Ministry of Aviation for exports of Service electrical and electronic equipment and being represented on the Operational Requirements Committee, the Weapons Development Committee and the corresponding committees of the Service Departments.

CONCLUSION

99. Great difficulties face the Defence Departments in attempting to assess the future needs of the Services for all forms of equipment. In the case of electronic equipment the difficulties are particularly noticeable on account of the complexity of the techniques involved and their comparative novelty. Your Committee have examined the present methods by which the Ministry of Defence and the Ministry of Aviation attempt to overcome the difficulties, and have found that they have not always been successful. No one would pretend that there is a ready-made solution to hand; the suggestions Your Committee have made may help to lessen the difficulties, but it may well be that some more radical changes are needed, which it would be beyond the present terms of reference of the Estimates Committee to suggest.

100. The greatest problem in the field of electronics is the regular need for speed. Such is the advance of techniques that under the present procedures there is more than a possible danger that an idea conceived by the Ministry of Defence in 1965 will be completely out of date by the time the concept is translated into equipment on the ground in 1975 or later. One of the difficulties in the present arrangements is the multiplicity of Departments involved. For electronic equipment the three Service Departments of the Ministry of Defence are responsible for the initial requirement, for determining quantities and for storage management, with the central part of the Ministry of Defence exercising an overall co-ordinating role; the Ministry of Aviation are responsible for the actual procurement of almost all the equipment although the Ministry of Defence (Navy Department) procure some of their own. Account must also be taken of the role of the Treasury and the Stationery Office in relation to computers and the as yet rather nebulous function of the Ministry of Technology as the sponsor of the electronics industry. The removal of this sponsorship function from

the Ministry of Aviation seems to enlarge the gap between the military and civil uses of electronics, which is the opposite of what is desirable. In the ever-widening area of space communications other Departments such as the Post Office are concerned.

101. At present electrical and electronic equipment for the Services is treated in much the same way as any other piece of equipment. There are obvious practical reasons for this, but there are equally many difficulties caused. One can with a reasonable measure of certainty plan ahead for a new gun; the main difficulty may be in deciding for how many gunners it will be required. To plan ten years ahead for a new communications system is to take a step into the unknown. From their examination of the subject, Your Committee are not altogether satisfied that it is right to treat all equipment on the same basis, and there may be a case for regarding electronics as something out of the ordinary, to which special considerations must apply. The present division of departmental responsibility does not lend itself to the bold decisions which are necessary. All the skills and techniques of industry must be harnessed together, and there must be no divorce between the military and civil applications of these skills. There is a case for extensive re-organisation of the machinery of the Departments if they are to cope with the ever increasing complexities of one of the most rapidly evolving technologies.

SUMMARY OF RECOMMENDATIONS

102.—(1) A thoroughgoing review should be undertaken of the security classification of electrical and electronic equipment for the Services including the desirability of regular re-classification after a lapse of time (paragraph 8).

(2) The Ministry of Aviation should review the programme for individual research projects with a view to increasing the proportion of contracts placed with industry (paragraph 17).

(3) Whenever possible, interim reports of feasibility studies and project studies should be made so that preliminary decisions on whether to proceed to the next phase can be taken (paragraph 22).

(4) The Ministry of Aviation, in consultation with the Treasury, should ensure that the Contracts Division is so staffed that a technical cost estimator can be attached to and remain with each major project throughout both the development and the production phase (paragraph 24).

(5) The Ministry of Aviation should reach a decision on the recommendations of the Lang Report in the very near future, and should give serious consideration to the further reorganisation of the staffing of the Contracts Division (paragraph 25).

(6) A common electrical and electronic Inspectorate should be established for the Defence Departments and the Ministry of Aviation, and consideration should be given to extending this to other fields (paragraph 28).

(7) The development contracts for the Clansman sub-section of the Hobart system should be placed at once, and every effort should be made to produce the replacement for the A 41 set before 1972 (paragraph 41).

(8) The Ministry of Defence and the Ministry of Aviation should give early and thorough consideration to the possible use of space satellites for tactical as well as strategic military communications with a view to using such methods if possible in the trunk communications system planned for the Services (paragraph 45).

(9) In the conditions for tendering for Government data processing, it should be made clear that in future contracts the clause relating to claims for delay should contain no maximum limit (paragraph 56).

(10) The Treasury and the Ministry of Defence, with the assistance of the Ministry of Technology, should now plan an integrated computer system for operation within the Defence Departments by 1970 at the latest using compatible installations capable of meeting the requirements of all three Services (paragraph 61).

(11) The employment of military personnel as systems analysts or programmers at computer installations should be discontinued (paragraph 63).

(12) The Treasury should examine with the Ministry of Defence the whole problem of training staff in computer technology, with a view to further centralising and increasing the present training facilities (paragraph 64).

(13) The United Kingdom Central Codification Authority should be transferred from the Ministry of Aviation to the Ministry of Defence and should take over all tasks at present carried out by individual service codification authorities (paragraph 69).

(14) The complete range of military electrical and electronic equipment should be codified to the N.A.T.O. system within the next two years (paragraph 70).

(15) The Ministry of Aviation and the Ministry of Defence should put into effect as soon as possible the recommendations contained in the Burghard Report (paragraph 71).

(16) Electrical and electronic equipment should have the first priority in any new study undertaken into the management of stores for the Services (paragraph 72).

(17) Whenever the possibility of purchasing a foreign aircraft is contemplated, the electronics industry should be informed of the situation and given an early opportunity to produce equipment capable of inclusion in such an aircraft (paragraph 79).

(18) In the case of the joint Anglo-French projects for military aircraft signed on 15th May, the electronics industry should be consulted at the earliest possible stage of the discussions, and any detailed agreements as to allocation of work between the two countries should relate specifically to electronics as well as to engine and airframe (paragraph 81).

(19) Where two electronics firms competing for a foreign order agree to abide by a choice made by the Ministry of Aviation, the Ministry should select the firm they think most likely to win the order and give it the full backing of the Government (paragraph 88).

(20) The principles of the Research and Development levy should be reviewed in relation to the exports of electrical and electronic equipment for the Services (paragraph 91).

(21) The Ministry of Defence should set up an Exports Division headed by a Chief Exports Adviser drawn from industry and a Deputy Under Secretary of State, with a view to the division taking over the present responsibilities of the Ministry of Aviation for exports of Service electrical and electronic equipment and being represented on the Operational Requirements Committee, the Weapons Development Committee and the corresponding committees of the Service Departments (paragraph 98).

3rd November, 1965.

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294. Is there any effort to obtain any integration at the higher level either with the Civil Defence, or the GPO, or the Police at all, for the use of radio communications?—As I say, for the strategic type of radio we buy from industry the same type of equipment as the Post Office buys.

295. That is very interesting, I did not realise that. Now the final question I want to ask you is under paragraph 3, "The Static communications of the Army are those above Corps level and across the world-wide chain of command. The equipment includes cable links, radio relay, switch-boards, teleprinters and other associated devices." What sort of integration have you got with the other services in regard to that static communication?—(Mr. *Whittuck*.) Perhaps I could quote a Defence White Paper to you, Sir? The Paper published yesterday, paragraph 192, gives you information on this.

296. If I may come back at you, I would like to know what the nature of the progress is?—I think this is the progress really, that we have these existing centres at Aden and Bahrein. We have got an advanced stage of study of the possibilities of Singapore, and there

is a Standing Committee which is considering the feasibility of integration generally.

297. Is that a Committee of the Army?—(Brigadier *Robinson*.) It is a joint tri-Service Committee, the Defence Signals Board.

298. Is that the Global Communications Network Headquarters?—The name Global was mentioned at one moment. Up till recently each of the three Services has had its own long-distance strategic network. We are now trying to look into the setting up of a central management to take over managing the three networks and to rationalise them and co-ordinate them into a single joint Service strategic network, and we hope that our recommendations on how this should be done will be forwarded in the fairly near future.

299. Will that come under the Chief Signals Officer of the Ministry of Defence?—Yes it will, the Assistant Chief of Defence Staff Signals, that is General Whistler at the moment. He is Chairman of the Defence Signals Board.

Chairman.] Thank you very much indeed, Gentlemen, for coming along.

THURSDAY, 4TH MARCH, 1965

Members present:

Sir Eric Errington, in the Chair.

Mr. Gordon T. Bagier.
Sir Beresford Craddock.

Sir Richard Thompson.

Mr. G. S. WHITTUCK, C.B., Assistant Under Secretary of State (Equipment), Mr. G. W. WATSON, E.S.(1) Division, and Mr. D. J. CHAPMAN, E.S.(1) Division, Ministry of Defence (Army Department) called in and further examined. Mr. H. R. HUBERT, O.B.E., Director of Sales and Lt.-Col. J. H. COOPER, Signals(36), Ministry of Defence (Army Department) called in and examined.

Chairman.

300. Mr. Whittuck, I see a new face amongst your friends, would you introduce us?—(Mr. *Whittuck*.) There are two new faces. On my left is Mr. Hubert, our Director of Sales in the Army Department, and this is Lt.-Colonel Cooper of Signals (36). He is here in place of Brigadier Robinson, who is a casualty of today's snowstorm. I think before you ask any questions, Sir, I ought to offer an apology for the

earlier draft of this set of figures which I am afraid was wrong, and we are very sorry about that.

301. I tried to do a little homework and I did find it a little difficult. Anyway, we will see how we get on. Perhaps we might look at question 182, that largely deals with Malaya. It is not quite clear from that exactly how we stand, but I am a little concerned about these various man-pack sets, and I think

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perhaps we might try and clear that so that we understand exactly what happened about that. As I understand it, the 19 and 31 sets were the sets in use after the war, is that correct?—(Lt.-Colonel Cooper.) Yes.

302. Would it be also correct to say that the 31 set is a light set which is carried by the man?—That is right.

303. Is the 19 set not so easy to carry, and is it more used by platoon headquarters?—Yes, it is vehicle-borne or mule-borne.

304. It may be vehicle-borne?—It was designed as a vehicle set originally.

305. So it really was a difficult thing to move about?—Indeed.

306. Are they both HF sets?—Yes.

307. I did start off this inquiry by saying I did not like initials, sometimes they are difficult to read in a report, so what does HF stand for?—High frequency.

308. Then there came an A41, which was very high frequency, VHF?—Yes.

309. Was that to replace both the 19 and the 31?—It was to replace the 31.

310. Is it fair to say that has been coming in since about 1962?—That is right.

311. And there has been quite a substantial amount expended on it?—Yes.

312. In fact would you describe that as a success?—Yes.

313. But was it not necessary to continue to use the 19 and the 31 due to the problems that arise in jungle country and hilly country?—That is so, but the 41 was in fact used in BAOR and elsewhere, and it is the current set. We did use it in Malaya where conditions allowed it to be used, it is modern and easy to carry; where we had to resort to longer distances which you can only use HF for we had to use HF sets.

314. Could you explain that simply? How it is that the VHF was not suitable for jungle purposes?—It is the screening of the wet trees, and that sort of thing. You can work it in clearings and you can work it in bush and bamboo, but when you come to high foliage

and you want to communicate outside the jungle to other posts, then you need high frequency.

315. That really meant that you went back to the 19 and 31?—And the 510, which is an Australian set and very much lighter and smaller.

316. We have not met 510, I think, where did that come from?—It came in about the same time as the 41 in very small numbers. It is an Australian made set actually.

317. Was it purchased from Australia?—Yes, in limited numbers. It was found very convenient. As you said just now, the 19 set was not really designed as a man-pack set, and it was found this other one would serve much better, and the battery supply of it was easier, and so on.

318. What sort of numbers were they ordered in?—Of the order of 300 or 400.

319. We then come on to the existing high frequency set which will not be in service until 1966?—You have the A.13 in mind? (Mr. Chapman.) It has started coming into service now.

320. But not very much?—(Lieut.-Colonel Cooper.) No.

321. What merit has the A.13 got?—If you compare it with the 510 I have just mentioned, it is a good deal more powerful, it is a much more modern set.

322. How does it compare with the 19 and 31?—In range it gives you as much as the 19 but with nothing like the bulk in weight and size. The 19 set is a vehicle set. The A.13 is a man-pack set that produces the same ranges roughly with a lot more and easier tuning facilities than the old 19 set.

323. That really means then until the A.13 comes into full production the Far East is using equipment that is not up to date?—It is using the 510, which is the nearest, and one other set, the 62.

324. Let us see if I can get this right, because it does seem to me to be important: you say the 510 is in use in the Far East, does that mean the 19 set and the 31 set are no longer in use?—Yes, in fact the 19 set has been taken out of use for some time and replaced by a 62, which was a little easier to carry

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Again it is the same size and the same design as the 19, and the same vintage.

325. We seem now to be getting into a great many various sets, and I do not think I have got the information to ask questions on this. Just let me go on with this, and perhaps you will tell me what the answer is. The idea is eventually that the signals arrangements will come under the Hobart scheme, and the Clansman will be the set for the forward people, the man-pack set. Now as I understand it, the Hobart set is anticipated to come in in 1972. That really in effect means that the A.13 will have a life of six years?—(Mr. Whittuck.) Although I think 1972 may be the general date for Hobart, it comprises, of course, several different sets, and the set which will replace the A.13 we do not think will be coming along until perhaps two or three years after that.

326. Brigadier Robinson, when he was here, indicated that they were starting at the front end of Hobart—(Mr. Chapman.) They are introducing the VHF sets first, not the HF. In other words, the VHF sets will be produced in the Hobart range first in 1972-4. In 1974 onwards we will get on to the Clansman high frequency sets.

327. I do not know specifically about the Clansman, which is part of the Hobart, which is general?—(Mr. Whittuck.) Clansman is a generic name for several different types of set.

328. Question 197, that is still talking about the Clansman, the Junior?—Yes, but that is several different sets.

329. What do you anticipate will be the approximate date of the first, from 1972 onwards?—There will be a number of different sets, some of which will come in in 1972 and others of which will be a year or two later.

330. I can only take the dates that are given. Anyway, the point of the thing is that if they come in in 1972 then the A13 will be in the process of being replaced?—Yes, there will be a set replacing the A13, but that set we do not think will be coming along until 1974 or 1975.

331. You see, the set is in the picture of Hobart, and last year we were told, in the Defence White Paper, "The new

system of radio communications known as the Hobart Plan is now under design study. Hitherto Army signals equipment has generally been developed in response to individual needs. This has introduced a diversity of equipment which creates problems. The Hobart Plan embraces the whole range of field Army signals from the complex exchange to the smallest man-pack radio in forward units"? —We now have in service something like 24 different types of man-pack and vehicle sets. When the Hobart net radio system comes in those 24 will be replaced by about seven different sets. The set which replaces A13 will be one of those seven. Although we hope that some of the other sets will come into production in 1972, this particular set we do not expect until 1974/5, so we think the A13 will have something of the order of eight years upwards in service.

332. I must confess that I find some difficulty in these sets and their availability for service. Take the A41, is that an all-purpose set?—(Mr. Chapman.) It is a VHF set for Infantry at battalion, company and platoon levels.

333. What is the Clansman, that part of the Hobart set, is that going to be all-conditions?—There will be four VHF sets to replace a large number of VHF sets, one of which you have seen here, the A41. In other words, the sets we mention here are not all the sets in service.

334. We have got some of the A13, are we still producing the A41?—Yes.

335. I am just a little bit concerned about this. I was under the impression, thanks to your kindness in supplying me with a Defence memorandum, that there were three man-pack radios, but are there more than that?—(Mr. Whittuck.) Yes. This paper only tries to explain what provision we made in the three years for radio sets. Over and above these there will be sets in use which were produced before this time.

336. Do you agree with me that it is impossible for the Committee to really arrive at a situation of knowledge unless one knows all about this? I had in mind that possibly one or other of these things might have been the subject of backward study. You will remember I did mention, I am not sure whether

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it was last time to you, that because we could not project into the future very easily we thought we would be able to project backwards to see when and how the operational requirements for these were arrived at. But it is no good looking at one operational requirement. It is obvious we would require to look at as many operational requirements as produce sets?—We have done our best to produce the information we thought you wanted. It seems to me, from what you have been saying, that perhaps we ought to supplement this by producing a list of all the sets, man-pack sets and vehicle-borne radio sets, in use by the Army at the moment.

337. I think that may also be necessary. It is not so much that, it is to know how these numerous things arose, presumably there was an operational requirement for them?—There must have been at the time.

338. And how that has in fact worked out. I had in mind, as I say, as we could not go forward because of the new system of determining projects, we wondered whether we ought to go backwards, and, if so, this seems to be a subject on which we could probably go backwards?—We could, if you wished, supplement the information about these ten sets by a statement of what the other sets are, what their purpose is, on the same lines as this, and possibly write introductory paragraphs explaining how they all fit together.

339. What somebody must have said at some time is, "We want a set", and I would like to know what the set was directed to. Is that too difficult?—There will have been a separate operational requirement for each of these sets. Would you like to see, for example, a specimen operational requirement and see which set actually emerged to meet that requirement?

340. There seem to be so many that emerged, that is the problem. I do want to limit our investigation if we can. But this is very important. I am quite surprised, and I say it quite frankly, to find that there are as many as ten man-pack sets that are floating about, whether they are being used or not of course we do not know?—I think we would admit there are a considerable number, and we are seeking in the future to

reduce these to a very much smaller number.

341. That, of course, raises a point too on the Hobart system. I have gone wrong on the Hobart system in the sense that I thought it was starting at the man-pack end, but apparently it is not, the man-pack comes after the other portion of the Hobart. Am I right about that?—No, Sir. There is one particular man-pack set which is a high frequency set, which in fact will be produced rather later than the others, but there will be some very high frequency, VHF, man-pack sets produced at the beginning of the programme. (Mr. Chapman.) The Clansman sets cover both HF and VHF, and the VHF sets in the Clansman range will be produced before the HF sets. This means there will be no set to replace the A.13, as Mr. Whittuck says, until 1974, if not later.

342. Without being too technical, can you tell me why that is?—The high frequency sets are more expensive and more complicated than the VHF sets and it will take longer for research and development to proceed upon them.

343. I think the best thing is for us to have the operational requirements of any sets that are of reasonable importance in these matters and a short description of any others that have in fact been used. I take it the Australian 510 was a stop-gap more than anything?—(Mr. Whittuck.) Yes indeed. We will of course give you what you ask for, but it would be a fairly large task to dig up all the operational requirements which have been met by the sets now in service. I wonder if you would be content if we picked out one or two specimens?

344. Perhaps I am misunderstanding what an operational requirement is. I thought somebody said they wanted a certain thing, then it went through the usual channels, which are rather different now to what they were and one must make allowances for that. But on the new basis there would be a clear operational requirement for a set that would do certain things, is that right? Or do you collect operational requirements and produce a set that meets more than one?—Generally speaking each of these sets will have

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been produced in response to a specific operational requirement, therefore the 24 sets, or so, which we now have in service will, I think, have been produced in response to 24 different operational requirements stated at different times.

345. Is there any difficulty in dealing with that in that way? Let us know what the operational requirements are. I think the main ones at the moment are the A41, the A13 and the Hobart set, so that we can understand exactly what is happening?—What you call the Hobart set, of course, so far as Clansman, the net radio, is concerned, will amount to some seven or eight different sets.

346. If you could make it clear, because I am sure you will agree that anybody looking at this must be rather staggered that there are so many sets about?—I think we see what you are after.

Chairman.] I hope I have made it clear. I am sorry it involves some problems, but I think that we have got to investigate it.

Sir Richard Thompson.

347. To the layman it seems extraordinary that there should at one time or another in the last few years have been an operational requirement involving the supply of, I think the figure was, 24 different kinds of sets. This is really, I presume, because communications in different parts of the world for different kinds of tasks are so incredibly complicated that you have to break it down into this number of components? Or is it that really there has not been too much co-ordination between those putting in the operational requirements, so that a number of different authorities have had a radio set designed for them and have not paid too much attention to existing equipment either in use or on order which, with a little modification, might have served their requirements?—I am not sure I can say without knowing exactly how the situation arose, but we are certainly hoping to improve it in the future, and certainly there is now pretty elaborate machinery for co-ordinating these re-

quirements, and, as we have said, we seek to reduce the number of types in use very considerably.

348. Following on that, it seems, even with this great proliferation of equipment, we had, as a stop-gap, to make use of some Australian sets at some time for some purpose, so it looks as if even 24 sets ordered did not supply the variety of equipment we needed for a particular task, is that the case?—(*Lieut.-Colonel Cooper.*) First of all you were talking about man-pack sets in Malaya just now. There are not 24, when we said 24 that is all the versions in the Army and in some cases there are two identical sets which tune to slightly different ranges and have slightly different numbers, they are in the 24, so it is nothing like as formidable as it sounds. There has been co-ordination over the years, and all these 24, of which only about six are man-pack sets, have been spread out since the war. The story is the 19 set was designed as a vehicle-set in the war, as you know, and so was the 62. The 19 set was too heavy, the 62 was better, although it was meant for mules and also for vehicles. Anyway, it was put on a man's back and used. It still is used in Malaysia to this day, but only just. To substitute something much lighter we bought a number of 510s, those were the HF sets. The 510 is Australian; we bought those because the Australians had been using them and found how well they worked in this limited range and environment. While we bought the 510, A13 was being designed, and we knew that, and that is why we limited the purchase of the 510. It was a stop-gap, but it was a stop-gap between the 19 set, which was hardly man-portable, and this 62 which I mentioned, both war-time sets, so you have got a large gap in years there where there was this stop-gap of only about 300 sets. As a matter of fact there was another one, the HF 156 which was bought in just about the same quantity as the 510, but the operational requirement for both that and the 510 was for something lighter for company level, battalion level, of HF type, to replace the 62 and 19 which could hardly be carried.

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Mr. Bagier.

349. I want to be quite clear in my mind that these were different operational requirements for each particular set, or was the number of sets available caused by improved refinements in different sets coming in at a later stage? Do you, for example, for a particular operational requirement, call in everything you have got in that field to replace it with what you are buying at this stage for replacement benefits? If there has been a refinement for something to be replaced this year, and the other set is not quite ready, for instance as you explained on this Australian set, do you buy it, does this become an additional set? Could you have, for example, three or four sets doing the same operational requirement?—You might have, not three or four, but one or two, and you get a case like Borneo arising, where you need some more sets and you need them for guerilla warfare, something like that, something a bit unusual where you cannot adapt something that you have got currently. You may have something coming along, but in that space of time you might have to buy something like the 510. But in this case of the operational requirement you are considering the 19 set and the 62 set, which you mentioned right at the beginning, the operational requirement for the 19 set was a set in a tank, it was never envisaged that it would be used even in infantry when it first came in in 1941. The 62 set was intended to go into soft vehicles or occasionally on a man's back or on a mule and was nearer the category in mind, still not a man-pack, but supposed to fill the gap. After the war we had so many of the 19 type and the 62 that they were used for all sorts of things although they were not always absolutely suitable, they were used because they had to be used. When we had our new operational requirements for the new type of set, then those new type of sets were designed.

Chairman.

350. The A41, which is a VHF set, was that not intended to in fact get rid of the rest of the sets, that was going to be a universal set, was it not?—It could not be universal if it was VHF only. It was for a different environment, it was for rather more line of sight,

short distance, light weight. That can be used in open country, not so easily in the jungle. Its requirement was not for use in the jungle.

351. I think we had better have the operational requirement, particularly of A13 and A41 and the Clansman, then if you would just write a short note dealing with the others, because I think this is very important, this is the test that we can apply to the previous, whatever may happen in the future, requirements for this particular kind of equipment, this man-pack equipment?—(Mr. Whittuck.) Yes.

Mr. Bagier.

352. On the actual drill for a request for a particular set coming into the Army Department, could you explain what the procedure is then to find out whether there is anything that the three armed Services have available for use before starting to produce it specially?—The requirement is examined by all three Services, it is also passed to the Ministry of Aviation.

Chairman.

353. I think the best thing would be for us to get the material and to see what the operational requirements are, then we can follow up from there. But we are really rather in the dark at the moment. Question 212, this is the level of reserves, and we have observed that in the Annex which relates to the Navy Department, paragraphs 11 and 12, the system used by the Navy is to calculate their reserves on a time basis as opposed to a percentage basis. Has any consideration been given to that by the Army?—(Mr. Whittuck.) I am not sure we are talking about quite the same thing. In question 212 I was explaining what reserves we held as complete radio sets. Paragraphs 11 and 12 of the Naval Annex, as I read it, is referring to spares, and they provision, as they say, on a time basis, and so do we for spares.

354. Am I right in saying this, that according to your answer in 212, towards the end, "We would normally order an additional supply of spares with the new equipment equal to two years' requirements", the Navy seems to put it at much less than that, something like nine months. Can you account for that?

—I frankly do not understand the naval system fully, but they do say "and covers provision for 24 months" plus certain other reserves.

355. Nine months reserve for low value category items, six months for higher values, standing contract items, four months?—Before that, in the second line, they say, "covers provision for 24 months", plus the reserves you have just mentioned.

356. Whatever be the position, is there any attempt to coordinate these in the same way in regard to reserves?—Yes. You will appreciate that each Service has developed its own provisioning system. One of the many rationalisation studies that is now being made does cover provisioning of equipment. We are hoping that the methods of the three Services will be brought closer together in the future.

357. May I refer you to 257? I want to ask about the Thunderbird in this connection. The Thunderbird has been in service for between two and three years, has it not?—Thunderbird 1. There are two versions of the weapon. Thunderbird 1 has been in service for some years. The radar which we are referring to here is the radar for Thunderbird 2, which is a weapon not yet in service.

358. It shows how careful one must be to make it clear. That is Thunderbird 2. How long has that been in service?—Thunderbird 2 is not yet in service, it is in production.

359. Do you imagine there will be any difficulties at all in regard to the radar equipment for that? Will it come in at the time when Thunderbird 2 is in operation?—The problem, of course, is to produce the weapon and the different radars in line. I am not sure they will necessarily all appear at the same time, but we think in some two to three years the entire system will be in operation.

360. You use the word appear, they obviously do not come out of the air, but is there some method by which you can be sure that the radar equipment will appear simultaneously, or as near simultaneously as makes no matter, with the actual weapon?—This is a Ministry of Aviation task, because they have the responsibility for producing these

items. We state the demand and we are in their hands very much as to the rate at which they are produced.

361. Is there a certain amount of discussion between you to ensure that that does happen, or who is the responsible person to see that it does, a representative of the Ministry of Aviation?—They are responsible for producing it. Obviously if we see any delay developing we make representations to them.

362. I have got a note here about Green Archer. Would it be possible to have some particulars of the operational requirements for that and how that has been dealt with? The dates, of course, are important on these matters?—You would like to see a copy of the operational requirements that led to Green Archer?

363. Yes, and the date, of course, so we can follow it through. Is that in full production now?—Yes it is. (Mr. Watson.) Green Archer is complete. All the equipments have been delivered.

364. Have you any certain knowledge as to the date of the operational requirement of that?—(Mr. Whittuck.) I would have to look it up.

365. Perhaps it would be better that way. Now may we go to repairs and inspections, which are under paragraph 195(b) of the Defence White Paper. "Measures have been taken to strengthen arrangements for inspection". What I would like to know, and I think the Committee would like to know, is, does that mean inspection during manufacture or does it mean when it is actually in the field?—Paragraph 195(b) of the White Paper refers to inspection during manufacture, whereas, of course, our memorandum to you refers to inspection of equipment in service.

366. Does that mean then that you have no responsibility for its inspection until it comes into service with you?—That is right. The Ministry of Aviation are responsible for delivering a properly inspected item to the Army.

367. Paragraph 13, Ordnance Depot regular routine inspections, have you any information about how often that occurs?—It occurs annually in the units, but at longer intervals in the depots.

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[Continued.]

368. Does that apply to R.E.M.E. as well as the Ordnance?—(Mr. Chapman.) Inspection is by R.E.M.E.

369. And it is done in the Ordnance Department?—It is done in the Ordnance Depot by R.E.M.E.

370. This is an interesting document which you were kind enough to supply us with. I do not think the Members of the Committee will want to retain it, but the point about this is this is a very big document and would you tell me the way this works?—(Mr. Watson.) This document is kept with the equipment, and people who carry out tasks on the equipment, such as the soldiers who are in charge of it, would record what they did and when they did it in this book. You will notice a lot of the pages are identical to allow for a large number of different entries from time to time.

371. But what happens then? It is a nice piece of book-keeping, what happens to it?—It is available to the Commanding Officer to ensure that the tasks have been properly done and to record they have been properly done. It is also available to R.E.M.E. when they come to carry out their inspections of the equipment from time to time.

372. Would R.E.M.E., doing what I presume is the sort of middle of the repair work, require to look at this before doing the repair?—They probably would.

373. That is an instruction, is it?—I do not know whether it is a specific instruction, but one thing they would certainly want to know when they came to inspect any equipment is what has been done to it since they last saw it. This is the place they would go to find out.

374. When a piece of equipment has to go back to base, if I may put it that way, this book goes with it, does it?—Yes.

375. What happens if you send half the set back, do you send half the book?—Normally you would send back either a complete set or a component. If you send back a component you would replace the component in the set and the book would remain with the basic set

376. They cover components, do they?—No, the book covers the set itself. (Mr. Whittuck.) There is no corresponding document for components.

377. Is this effective? Is it used?—(Mr. Watson.) I think it is most certainly used.

378. Who checks that?—The Commanding Officer of the unit would be responsible, and on top of him the R.E.M.E. people who do the annual inspection.

379. We will probably see these things in action at Donnington?—I think you may well do.

380. That would be the place where these would come for a serious repair?—They probably would not be repaired at Donnington. These sort of equipments are stored at Donnington, but they would probably be repaired at Old Dalby, which is the R.E.M.E. workshop which does the base repairs.

381. I am bound to ask what happens to the piece of paper? Presuming, for example, a valve, or something of that sort, wanted repairing, or something more serious perhaps than a valve, some piece of paper goes out of this book and goes to the people who are repairing, does it not, or does this stay as it is?—This book stays with the equipment as it is. There is no particular leaf in the book for each particular component. The book records various tasks which are carried out on the equipment as a whole, such as testing to make sure that the whole thing works properly.

382. What happens with repairs then, serious repairs?—There is in fact a separate book called the Radar Record Book, which records the major repairs and modifications which are carried out to the basic set. This is more a R.E.M.E. responsibility and not a unit responsibility.

383. Will we be able to see that?—You can have a copy of this if you wish.

384. When the repair has been achieved, then it comes back and the book joins the equipment?—Yes.

Sir Richard Thompson.

385. Really this is a record of the whole life of the equipment, is it not, whether the operator simply uses it for

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research purposes, or whether he carries out calibrations, or whether he finds it does not work and takes some action to try and put it right? Everything has got to be entered up in here as if it were a ship's log, then when the R.E.M.E. men come at intervals to check the equipment they presumably get some guidance on what needs to be done, if anything, simply by looking at the state of the log at the time it is inspected?—
 Yes.

386. Is it your view that this very complete documentation of everything that happens to the equipment is used and is useful, or is it susceptible, for instance, to a careless operator simply putting the necessary signs in the columns and trouble developing from that?—He signs, as you will see from the book, that he has done a particular task. If subsequently some fault occurs which shows that he may not have done it properly, this is something which presumably his Commanding Officer would pursue.

Chairman

387. Supposing this is not in fact looked at?—I think it would be most certainly looked at, if a fault developed on an equipment, by whoever was investigating this.

388. Supposing the set comes to an end of its useful life, what happens to the logbook? Who gets it?—I doubt if it has any residual value, because the set would presumably be broken up to its component parts for disposal. The book will then have served its purpose.

389. Who will do that, Donnington?—This, I believe, would be done at Donnington.

390. We will see that, would that be right? We may as well know what to look for at Donnington?—(Mr. Chapman.) As far as I know the sets are broken down at Donnington.

391. Do you get a new logbook, if there is cannibalisation, if you like, supposing you make one set out of two? Do you do that?—(Mr. Watson.) No, not as far as I know.

392. Anyway, Donnington will tell us?—Donnington can tell you certainly.

Mr. Bagier.

393. I take it the function of the logbook is purely to make sure the equipment is in full operational working order at all times and properly serviced, and this is a record of that? If there is any alteration to the radar equipment itself, any refinement or repairs, this is recorded in the Radar Record Book?—That is correct, yes.

Chairman.

394. Tell me about R.E.M.E. inspections, are those confined to units, or do they look at what is stored at the Ordnance Depot?—(Mr. Chapman.) They do an annual inspection of units, but they do a periodic inspection of Ordnance Depots. They cannot get round the Ordnance Depots every year, so they inspect them in cycles.

395. R.E.M.E. do the whole lot, do they?—Every unit is inspected by a R.E.M.E. Inspector every year.

396. That applies to the Depots as well?—Yes, Sir.

397. Why do you insist on regular inspections?—I think it is for two reasons: Inspectors look at the stuff returned from the units, that is the first thing they do. Then they look for deterioration in the existing stocks. It is found if there is not a regular inspection of stocks there is a marked deterioration in certain components in the sets, which means that when the sets are taken out for service, they cannot be used. It is found valuable in this way.

398. Are they on the same sort of basis as air inspection? Is there an Inspection Corps in the Army?—R.E.M.E. combine the function of maintenance and repair with inspection. It is all done by technically trained R.E.M.E. Army officers.

399. The Air Force Department do not worry about inspecting storage, according to the Annex relating to them?—I understand from them they have only just stopped doing this job, and they will review the situation in two or three years' time. They cannot say, therefore, whether they have found it successful or not.

400. Would you be prepared to consider the possibility of leaving the storage out, bearing in mind the competent people you have got at the Ordnance

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Depots?—R.E.M.E. feel this is very important, especially one part, the capacitors. If they are left for any length of time they wear out and this has a very bad effect on the efficiency of the set when it is taken out for service. So they feel inspection is very worthwhile as far as efficiency of the set is concerned.

401. Tell me about the relationship between Signals and R.E.M.E., and how they work together? One would naturally think that it would be possible for them to be more or less one unit?—(Mr. Whittuck.) Paragraph 15 of the Army Department Annex seeks to explain how the work is divided between them. It is a little complicated I think. We have ourselves been wondering whether it was the right division of duties, and there is an Army Department Committee in existence at the moment which is reviewing the general question.

402. Is that doing it actively, or is it one of those things that is not being pressed ahead with?—It is an active Committee.

403. The Air Force rely very largely on centralised repairing, because of its savings on replacement of components. Have you considered the possibility that you might be able to save some stocks if you centralised your repairs more?—I think their position is rather different in that they operate much more from completed, well-found airfields with elaborate repair facilities there, whereas the Army tends to be much more dispersed.

404. On the other hand, the Army has, in some cases, more manageable equipment, if I may put it that way. Has any consideration been given by the Committee to that?—Not that I am aware of.

405. Perhaps we will hear a little more about that afterwards. Now the questions of sales of equipment, I think my colleagues have got the new Appendix A in regard to that, this is a very small amount of the equipment sold as put in the estimates. I think there was something like £8,300,000 last year. So far as the U.K. disposals are concerned, it would appear in a corresponding period as £269,000. So that is a very

small portion of this rather big credit item, is it not?—Yes it is. I think the main reason is that by the time we declare electronic equipment surplus it has not got a very high disposal value. We find proportionately we get the bulk of our sales with things like vehicles, guns, and so on.

406. It really is rather peculiar, and perhaps you will be able to tell us about it, on the 26th November there were quite an amazing lot of equipments sold, 1146 cases of miscellaneous wireless equipment, 88 miles of electric cable, 9,750 quick-lime desiccators, while on the 25th February there were 12,800 power supply units no. 2 for the 19 set, which is still in use, and to cap it, on gross figures alone, there were 137,650 crystal units various. Now these may not be of total value very much, but what has happened here? Have these been used and are just being disposed of? Can they no longer be used, or were they over ordered?—I think we would need to go into this question as to how this particular equipment became surplus.

407. If it is necessary too, I really do not want to get too much on our plate, but there does seem to be a great deal of stuff, and unless you can give the Committee a quick answer I think perhaps we had better find out what is the cause of this, whose responsibility it is to say, "I propose to sell this"?—(Mr. Watson.) In fact it is the responsibility of the H.Q. staff through the Director of Ordnance Services. When the stocks are reviewed annually, if it turns out that more than a certain level of stocks exists, perhaps because some operational change has reduced the use of a particular equipment, this is then considered for disposal. It is not necessarily disposed of. The case is submitted to the Finance Branch, who examine it, and if, in the wisdom of all these people, it is thought it will not be required, then the surplus is declared for disposal.

Sir Richard Thompson.

408. That would explain why disposals are apparently made on quite a big scale of equipment which is still in use?—It could do, yes. Possibly a lot of this is used stuff which it is not

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worth repairing. If something costs more than a large proportion of its cost to repair it is better to dispose of it for a low price than attempt to repair it. (Mr. Whittuck.) We have sought to explain in paragraphs 3 and 4 of our note on sale and disposal the reason why.

Chairman.

409. It might be that there was over ordering?—It could happen.

410. I think perhaps anyway I would like to know what a quick-lime desiccator is, it is peculiar. The other thing is purely a question of estimates, the estimate of receipts from sale of surplus stores in 1959-60 was £8,300,000 and the amount actually raised was £9,153,000, which is not very accurate estimating, is it? The Appropriation Account shows what was actually raised as against the estimate. Why I am asking these questions is because I am wondering if sufficient attention is paid to these matters. I would like to know the person whose responsibility it is to look after these sales, how they are dealt with, do they say what they reckon is the reason for the sale of these particular things? Does anybody ask them, or do they just send them in to the depot and say, "Scrap"?—(Mr. Watson.) These sort of things would normally only arise at either a R.E.M.E. workshop because they had been condemned as no longer of use, or, if it is good equipment, at a Central Ordnance Depot either in this country or a base depot abroad.

411. Whose responsibility would that be?—The responsibility of deciding whether something was surplus or not?

412. No, for sale. Who says, "We must tell the auctioneer that we want him to sell these"?—(Mr. Hubert.) As has been explained, if the Army decides, through its procedures, it no longer requires an item or a group of items for military use, it is handed over to me to dispose of at the best possible value to public funds. Some things are sold by auction, some are sold by tender, one plays the two together to try and get the best results. To the extent where they go to auctions, in conjunction with the auctioneers my staff divide these things into suitable lots of different sizes to try and attract different kinds of

customers, big and small, and then these are auctioned on the appropriate day.

413. At what stage do you decide that you cannot sell these to other Government Departments or to somebody who can use them for a useful purpose?—The possibility of making use of it by other Government Departments is done by the holding depot before they come to me.

414. They deal direct with other Government Departments?—There is what we call a "shopping list" procedure. There is experience of what the Departments are interested in, what categories of stores. For instance, with the variety of electrical stores obviously the G.P.O. is interested in that and there is a system of advising them of certain stores which it is known they are interested in which are available to them as not being required by the Army.

415. That is not done at Ministry level at all? That is done as a matter of ordinary rule at the depots?—I would not say whether it is the Ordnance Depot or whether it is the Ordnance Headquarters that does it, but it is in the Ordnance organisation. (Mr. Watson.) I believe it is in fact normally done at Headquarters, if only for the convenience that this is in London where the other Government Departments are.

416. Have you had any difficulty in sales with regard to the rings which are becoming rather a difficulty at auctions?—(Mr. Hubert.) One can really describe rings as an occupational risk, in other words, there is always a tendency for them to form, and we have a whole battery of techniques to try and make it as difficult and as little profitable as possible. All in all we are reasonably successful. I did make a check of the different number of buyers for electrical and electronic stores at an auction sale which you have a catalogue of on November 24th or 25th last. There were 40 different buyers for electronic stores and 49 for electrical stores, and that suggests to the extent that there is ringing it is not effective, and if it is not effective I do not think it would have a substantial effect on the prices realised.

Chairman.] Thank you very much indeed, Mr. Whittuck and your colleagues. I do not think we need trouble you again at the moment.

Members present:

Sir Eric Errington, in the Chair.

Mr. Gordon A. T. Bagier.
Sir Beresford Craddock.

Mr. William Hamilton.
Mr. Neil Marten.

Mr. W. C. CURTIS, Head of Finance Division 6 (Air), Air Commodore K. B. S. WILLDER, C.B.E., Director of Telecommunications (Air), Air Commodore A. G. POWELL, Director of Radio (Air), Air Commodore K. T. NICKLIN, O.B.E., Director of Equipment 2 (R.A.F.), and Mr. J. D. ROTHERY, M.B.E., Finance Division 6 (Air), Ministry of Defence (Air Force Department), called in and examined.

Chairman.

417. Good afternoon, Mr. Curtis, I wonder if you would be kind enough to introduce your colleagues to the Committee?—(Mr. Curtis.) I am the Assistant Secretary from the Finance Division of the Air Force Department that deals with electrical, electronic, radio and radar stores. On my right is Mr. Rothery, who is Chief Executive Officer of the same Division. Next to him is Air Commodore Powell, who is the Director of Radio of the Royal Air Force. On my left is Air Commodore Willder, who is Director of Telecommunications of the Royal Air Force. Next to him is Air Commodore Nicklin, who is Director of Equipment and who deals with this range of stores.

418. Just to get the matter accurately, these are Departments that together work the electronics and electrical position in the Royal Air Force?—Yes.

419. If we might start with paragraph 19 of your memorandum, mention is made there of the Aircraft Equipment Committee, and also in paragraph 20 of the Air Force Department Servicing Equipment Committee. First let me ask whether those two Committees are the Committees that decide the quantities of equipment that are required, and are they the only two that do?—No, there is in fact one other series of Committees dealing with initial provisioning which ought to have been mentioned. These are the Committees that are concerned with determining the quantities of initial spares to be provided with new equipments.

420. I wonder whether you could make clear to the Committee how this fits into the picture of what I call the defence organisation? We mean by that the whole of the organisation rather than

the Royal Air Force alone?—In effect this follows on from the processes that were described to you by Mr. Wood and Mr. Lawrence-Wilson earlier on in the proceedings of the Committee. If I could perhaps take for example airborne equipment of all kinds, clearly a major decision has been taken when it has been decided what type of aircraft you are going to have, how many aircraft you are going to have and what sort of job they are going to do. Having decided that, it is not an especially difficult job to decide how much equipment of various kinds you require in the aircraft, either for it just to fly at all, or to do its particular job, whatever role has been allocated to it. Equally it can be determined what the deployment of the aircraft will be and whether it is going to have to use staging posts that have got to be activated. Considerations of that sort will determine how much additional equipment, other than the things that you have got actually fitted into the aircraft, you require, in other words, backing equipments. Having determined all that of course you have then got to determine what sort of spares you want and how many spares.

421. Perhaps I have not made quite clear the first point that I want to ask about, I know these things are difficult. When you order an aircraft—we know about the function of the WDC, etc.—does the requirement for that aircraft go back to the WDC and the other Committee of the Defence Ministry, or does it come directly back to these Committees that we are talking about now?—When you are talking about equipment that goes on to an aircraft it comes back to the Air Force Department to these Committees.

422. In what way does it come back, because you have got the Ministry of

APPENDIX 3

BRITISH ARMY MANPACK RADIO SETS 1941—
Memorandum submitted on behalf of the Secretary of State for Defence

Radio Set	Description	Quantity	Manufacturer	Date of Military Characteristic	Date of 1st Production	Date in to Service	Date out of Service	Remarks
WS 18	HF 6 to 9 Mc/s Range 2½ miles Weight 32 lbs	Approx.* 40,000	Pye	Not known	Mid 1940	1941	1950	
WS 38	HF 7.3 to 8.9 Mc/s Range 1½ miles Weight 13 lbs	Approx.* 200,000	Phillips Mullard Murphy	Not known	1941	1941/42	1950	
WS 46	HF 3.4 to 9.1 Mc/s Range 4 miles Weight 24 lbs	Approx.* 5,000	Cole	Not known	1943	1944	1954	
WS 68	HF 1.75-2.9 Mc/s/3-5.2 Mc/s Range 2½ miles Weight 31 lbs	Not known	Pye	Not known	1944	1944	1961	
WS 62	HF 1.6 to 10 Mc/s Range 7 miles Weight 59 lbs	Approx.* 8,000	Pye	Not known	1944	1944/45	Still in Service	
WS 88	VHF 4 channels between 38 & 43 Mc/s Range 1 mile Weight 11½ lbs	Approx.* 40,000	Cole	1944/45	1947	1948	In Service with TA and Cadets	
WS 31	VHF 40-48 Mc/s Range 2 miles Weight 23½ lbs	Approx.* 20,000	Murphy	1944/45	1947	1949	In Service with TA and Cadets	
SR A40	VHF 47-54.4 Mc/s 6 channels Range 1.2 miles Weight 10 lbs	Approx.* 6,000	Cole	Jul 1953	1958	1959	In Service	
SR A41	VHF 38.55 Mc/s Range 2-3 miles Weight 35 lbs	Approx.* 10,000	Murphy	Feb 1953	1958	1959	In Service	
SR A13	HF 2-8 Mc/s Range 12 miles Weight 28 lbs	Approx.* 3,000	Plessey	Aug 1961	1964	1965	—	
WSA 510	HF 2-10 Mc/s Range 3 miles Weight 25½ lbs	750 230	Australian	N/A	{ 1954 1963	1955 1964	In Service	
SR A43	VHF 240-300 Mc/s Range to aircraft at 500'—20 miles Weight 37 lbs	Approx. 700	Rediform	1959	1961	1962	In Service	
VHF Type 1202 (VB)	VHF 30-76 Mc/s Range 5-10 miles Weight not to exceed 20 lbs	Not yet known	Not yet known	Final Draft Dec 1964	1971	1972	—	
HF Type 1221 (HB)	HF 2-30 Mc/s Range 15 miles Weight not to exceed 20 lbs	Not yet known	Not yet known	Final Draft Dec 1964	1973	1974	—	

* Exact figures depend upon wastage rate and length of time in Service. Precise figures for the earlier year not known.