CONFIDENTIAL

REPMR/P(72)30

PROCUREMENT EXECUTIVE, MINISTRY OF DEFENCE

REPORT TO CER AND HIS ADVISORY GROUP

by the

WORKING PARTY ON RATIONALISATION OF EXPLOSIVES, PROPELLANTS AND ROCKET MOTOR RESEARCH AND DEVELOPMENT

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EPORT TO CER AND HIS ADVISORY GROUP BY THE WORKING PARTY ON RATIONALISATION OF
XPLOSIVES, PROPELLENTS AND ROCKET MOTOR RESEARCH AND DEVELOPMENT

INTRODUCTION

1 The Working Party on Rationalisation of Explosives, Propellents and Rocket Motor Research and Develop has the following terms of reference:-

To examine the possible measures for, and implications arising from, rationalising R & D work in the fields of Explosives, Propellents and Rocket Motors in order to achieve greater efficiency, economy and flexibility in the use of resources, paying due regard to possible variations on the future scale of such work and to the possible reorganisation of the rocket motor industry.

2 The membership of the Working Party is:-

Mr W B H Lord	DGERPB	Chairman
Dr L J Bellamy	D/ERDE	
Mr W J Challens	AWRE	
Mr V H E Cole	AS/ER2	
Mr J Cook	DCROF 2	
Mr J E P Dunning	D/RPE	
Mr F H East	D/RARDE	
Dr K D Errington	DXSW	
Mr J Harrison	DAWD	
Dr B H Newman	DR Arm	
Mr P R Wallis	DGRW	
Mr W W Abson	ER2a)	Secretariat
Dr H N Mortlock	Hd/ERPB)	

3 The Working Party submitted an interim report on 31st January 1972 and a progress report on 10th April 1972. We have held a total of ten meetings and now submit the following report on our findings to date.

BACKGROUND SITUATION

4 Explosives, propellents and rocket motor R & D work is spread over a number of Establishments and is closely linked with production involving several Ordnance Factories and Industry. The scene is complicated by proposals for increasing industrial participation; a Working Party has reported on possible ways and means of creating an Industrial Rocket Motor Organisation as a joint Industry/Government venture which would take over a large part of the development and production of these motors, and a clear lead on this industrialisation question will be needed before any plans for rationalisation in the propellents field can be put into effect.

5 The Working Party recognizes the problem that its work cannot be regarded as entirely independent of the work of other rationalisation Working Parties. Proposals made by one Working Party may interact with the cost and timescale of proposals being made by another Working Party and in some cases might invalidate those proposals or even, in combination, might suggest more advantageous alternatives. For our part, and in the time available, we have done no more than ensure that our proposals for rationalising aspects of the Explosives programme are mutually compatible with proposals on the Materials programme under considera by the Materials Working Party.

6 A further problem is that of AWRE. Although we have not been able to sugge any immediate rationalisation steps involving AWRE, it is envisaged that over th

years this Establishment will play a wider part in Defence research and development, and we consider that, given the resolution of problems concerning the integration of AWRE into MOD, it should be possible to evolve useful proposals for the transfer of work or the integration of programmes. In the meantime, we consider that the proposals we are now putting forward do not impede, and may well help, any rationalisation programme in which AWRE will be involved.

CONSIDERATION OF THE ALTERNATIVE POSSIBILITIES AND THEIR IMPLICATIONS

7 In the explosives field we have studied the possibility of concentrating all high explosives and initiator research and development at AWRE. This work covers chemical and physical properties, formulation, compatibility, filling techniques, and development of initiators. We have also considered the possibility of transferring pyrotechnics work to AWRE. In the propulsion field we have considered as possibilities either that there would be an Industrial Rocket Motor Organisation, or that there would be no such organisation, in which case either IMI Summerfield would continue much as at present or it would close and its work be redistributed.

8 Our first task was to translate the many alternative possibilities into more precise options and then to select the most promising of these for detailed studies. These studies could not be carried out by the Working Party itself and a smaller Study Group was therefore set up under the chairmanship of Hd/ERPB, Dr Mortlock. The Group considered three options: (1) the transfer to AWRE of all R & D work on high explosives and initiatory compositions intended for eventual use in conventional weapons systems; (2) the transfer from RARDE Langhurst to AWRE of R & D work on pyrotechnic compositions and their applications; and (3) a reorganisation of rocket propulsion work in which most of the R & D would be undertaken at RPE and ERDE, and all cast double base production at ROF Bishopton. In parallel with this, Dr Errington and Dr Newman studied the possible integration of the rocket motor and propellent R & D activities at either ERDE or RPE, and Dr Bellamy and Mr East the possible integration of ERDE and RARDE. We are grateful for all the help which was given to these studies by specialists from the R & D Establishments and from the Building Services Branch. Summaries of the reports by the Study Group and by Dr Errington and Dr Newman are at Annex A and Annex B. The report by Dr Bellamy and Mr East forms the basis for the note on the Future of ERDE, at Annex D.

9 The option to transfer explosives work to AWRE proved unrewarding. Although the capital costs would not be high the estimated staff savings would be small, and the strong links with applications development would be weakened without sufficient compensating advantages. We consider, therefore, that such a transfer would not justify the cost and disturbance factors involved.

10 We gave high priority to our study of the option of transferring pyrotechnics work to AWRE because plans were already well advanced to transfer this work from Langhurst to Fort Halstead. These plans seemed a sound economic proposition, but we felt that the alternative of a transfer to AWRE should be carefully investigated, partly to compare the merits of the two possibilities and partly to ensure that a transfer to Fort Halstead would not prevent or make more difficult some other moves which might seem more desirable in a wider context. In the light of the Study Group report we do not favour the transfer of pyrotechnics work to AWRE and consider that the plans to close RARDE Langhurst and to transfer its work to Fort Halstead should be implemented without further delay.

11 We have had to take account of the following alternative possibilities for rationalisation in the propulsion field:-

a That there would be a new Industrial Rocket Motor organisation embracing the functions of IMI Summerfield, Bristol Aero-Jet and part of RPE. Rationalisation would then deal with those parts of RPE which were not to be taken over by industry.

b That there would be no such new industrial organisation, and either -

i IMI Summerfield would close, its production work would be transferred to ROF Bishopton, and its R & D re-distributed between RPE and ERDE, with further rationalisation of these two Establishments.

or ii the work of IMI Summerfield would continue much as at present, although not necessarily under the present agency arrangement. Rationalisation would then concentrate on the resources at RPE and ERDE.

12 If an IMO were created, one of the main effects on Government establishments would be a reduction in the workload of RPE and of the ROFs; there would be no significant reduction in the workload of ERDE, and we have assumed that there would be no significant effect on ERDE's staff requirements. There is as yet no agreed figure for the reduced staff requirements at RPE in the event of an IMO being set up; estimates depend upon whether an intra-mural R & D capability comparable with that of the IMO would be retained, or whether the intra-mural programme would become mainly concerned with the more fundamental aspects of rocket motors. In the former case RPE would remain fairly near its present size, say 100 RDS; in the latter case it might be reduced to around one-third of its present size, say 35-40 RDS.

PROPOSALS FOR REORGANISATION

13 If the decision is taken not to set up an IMO, there would be considerable scope for rationalisation of the present resources for R & D and Production in the propulsion field. The following moves taken as a whole seem to us to offer the greatest possibilities, and would at the same time bring about some rationalisation in the materials field compatible with other proposals which we understand have been put forward by the Materials Working Party.

a The propellent work which is centred on the South Site ERDE, together with some ancillary work from the North Site, should be transferred to RPE.

b IMI Summerfield should be closed, and its R & D transferred to RPE. This, along with (a) above, would then give a single Rocket Motor R & D Establishment at RPE.

c The production work of IMI Summerfield should be transferred to the ROF organisation.

d Much of the explosives work of RARDE Woolwich should be transferred to the North Site ERDE, and integrated with the explosives work now undertaken there.

e The present materials work at ERDE should be retained there and the programme closely integrated with that of RARDE, which is envisaged as the centre for Army materials R & D. This would include the small amount of work on composites, which is decreasing.

f The whole of the North Site ERDE should then become an outstation of RARDE.

14 The arguments in favour of the proposed transfers are set out in some detail in the paper on the Future of ERDE at Annex D; as far as explosives, propellents and rocket motor R & D is concerned they may be summarised as follows:-

a Propulsion R & D would be concentrated under single managerial control at the best rocket motor site in the UK.

b All aspects of rocket motor production, for both guided and unguided rockets, would be largely concentrated in the ROF organisation.

c Explosives work would be concentrated under the managerial control of the Establishment responsible for its application; this would also facilitate further rationalisation at a later stage of all explosives work between Fort Halstead, Waltham Abbey and Woolwich.

d The South Site at ERDE and part of the Woolwich site would become available for disposal.

e There would be savings in running costs and the possibility of offsetting the capital and non-recurrent costs by receipts from the sale of land.

15 The estimated costs of these moves are given in Annex C. Briefly, there seems likely to be a saving in running costs of upwards of £600,000 per year; the capital and non-recurrent costs would be approaching £7M, but this would be at least partly offset by receipts from the sales of the South Site ERDE, of part of RARDE Woolwich, and of the Summerfield site. These receipts cannot be estimate with any accuracy until it is known what planning permissions might be granted for site developments; the bracket might extend from £1.5M to £13M or more.

16 If it were decided to set up an IMO it would still be possible to make some of the moves proposed in paragraph 13, but they would achieve much less. The move of propellent work from ERDE to RPE would appear desirable only if the Westcott site were still to retain a large measure of R & D and motor firings; if this were not the case, and if RPE were to be reduced considerably in size, a move in the reverse direction might be better in that the smaller unit would then be amalgamated with the larger. In that event there would then be three options for ERDE:-

a To run the South Site and North Site as mainly separate entities, the latter being an outstation of RARDE.

b To make the whole an outstation of RARDE.

c To omit the move of the Woolwich explosives work to Waltham Abbey and concentrate on the amalgamation of the residue of RPE with ERDE. Some explosives work might then be transferred from Woolwich to Fort Halstead. This would cost approximately twice as much as the move to Waltham Abbey and would mean that less land could be vacated at Woolwich.

We have not explored these various possibilities in detail; each would present some disadvantages as compared with the much more coherent plan which might be adopted if the IMO proposals do not go ahead.

17 If there were to be no IMO, but if the work at IMI Summerfield still remained on that site, the proposed transfers of work to RPE from the South Site at ERDE, and from RARDE Woolwich to the North Site at ERDE, might still go ahead with some advantage. However, an opportunity of concentrating all propulsion R & D at one site would be lost; and there would not therefore be the same gain to the staff transferred from ERDE as there would be if their work could extend over the whole propulsion field. It is this gain which would compensate for the loss of their wider contacts with the explosives and materials work at ERDE. Similarly, an opportunity would also be missed of concentrating responsibility for rocket motor production. We would not, therefore, favour the retention of the Summerfield site for propulsion work if there were no IMO.

18 The estimated capital and non-recurrent costs of the various moves discussed in paragraphs 16 and 17 are given in Annex C, together with those estimated annual running

costs. No estimates have yet been made of the additional running costs of an IMO so that full comparisons of running costs are not possible. The costs of these various moves are estimated, approximately, as:-

Capital and Non-Recurrent Costs

Setting up an IMO - £3M to £6M.

Concentration of intra-mural propellent R & D work at RPE - £3.7M, offset by sale of ERDE South Site - £0.1M to £10.0M.

Concentration of a reduced level of intra-mural propulsion R & D work at ERDE - £1.0M, offset by sale of the part of RPE site not required by an IMO - £0.1M.

Transfer of Woolwich explosives work to ERDE - £0.8M, offset by sale of part of Woolwich site - £1.0M to £2.8M.

Running Costs

The major changes would be:-

Additional costs of an IMO - not known.

Unrecovered overheads at ROFs to be borne by other work if rocket motor production were concentrated at an IMO - £250,000 per annum.

Savings from concentration of intra-mural propellent R & D work at RPE - £50,000 per annum.

Savings from concentration of a reduced level of intra-mural propulsion R & D work at ERDE - £2.0M per annum.

Savings from transfer of Woolwich explosives work to ERDE - £80,000 per annum.

19 We have not given detailed consideration to any possible requirements for motors of the Polaris size or larger as these would pose a special problem. We think that special arrangements would have to be made for this work to be undertaken at Bishopton; the present proposals are therefore unaffected by this possible requirement.

CONCLUSIONS

20 We propose that -

a The transfer of pyrotechnics work from Langhurst to Fort Halstead should go ahead immediately.

b If it is decided not to set up an IMO, the transfers described in paragraph 13 above should be made.

c If it is decided to set up an IMO, further consideration should be given to establish which of the transfers described in paragraph 13 would still be worth while, or whether the residual part of RPE should be moved to ERDE with a consequent choice between the options set out in paragraph

W B H Lord
DGERPE
Chairman of the Working Party
Main Building, Whitehall
June 1972

SUMMARY OF THE REPORTS OF THE STUDY GROUP ON COSTING

1 The Study Group's terms of reference were to examine and cost the following schemes:-

Scheme 1. To transfer to AWRE all Research and Development work on high explosives and initiatory compositions intended for eventual use in conventional weapon systems. This will in essence cover the present work of ERDE on high explosives and initiators and all work of EMI branch of RARDE. It will comprise R & D on new explosive chemicals and formulations incorporating these chemicals and will cover:-

1 Preparation from laboratory to pre-production scale.

2 Study and measurement of all relevant properties including those especially pertinent to explosives such as sensitiveness, stability, compatibility etc.

3 Development of filling and other user techniques for the explosives.

4 Design and development of initiating devices as components for use in ignition systems. Such devices would include caps, detonator squibs, short delays and the explosive trains of fuzes.

5 The provision of inert substitutes for the explosives to be used during hardware development trials.

6 It will include that part of the Woolwich Climatic Trials facility essential for R & D on explosives but not that required by RARDE or the OB for trials on weapons or equipments.

It is anticipated that advantage can be taken of existing common Services at Aldermaston such as Police, security services, canteens and the like. In addition, where surplus effort is available, the new facility should draw on common technical services such as workshops, drawing offices, publishing services, etc.

Scheme 2. To close RARDE Langhurst and establish at AWRE a facility with the equivalent of the present capability of Langhurst in research and development of pyrotechnic compositions and their applications.

It is anticipated that advantage can be taken of existing common Services at Aldermaston such as Police, security services, canteens and the like. In addition, where surplus effort is available, the new facility should draw on common technical services such as workshops, drawing offices, publishing services and so on.

The costing should not include provision for new facilities that would need to be provided at Langhurst in the future if no move were contemplated.

Scheme 3. To close IMI Summerfield and to transfer all production work on Cast Double Base (CDB) propellents to ROF Bishopton and to centre all Research and Development on ERDE and RPE. RPE would become the design authority for all CDB motors as they are at present for all others. All R & D would then be centralised within the Establishments and all production within the ROFs.

2 The costing covered:-

1 The cost of capital facilities including services created or transferre

2 The assessment of the staff needed to maintain the likely programme of work and resulting staff costs.

3 Non-recurrent transitional costs such as redundancy pay, staff transfer costs, site clearance, duplication of effort during transfer etc.

4 Annual running costs of both existing and new facilities.

5 Nett savings resulting from facility closed down.

Where it appeared sensible to exclude discreet areas of work included within the outlined schemes these were identified and costed separately.

3 After detailed consideration of the three schemes by separate sub-groups the Study Group reported as follows:-

Scheme 1. The facilities in use at ERDE, RARDE and AWRE have been compared. No new major facility would be needed and it is considered that AWRE could accommodate either this scheme or Scheme 2, but not both, with very little new building.

It is estimated that a saving of 4 RDS grades, 2 ON I and 6 Industrials would result from the move, based on the assumption that AWRE staff are fully loaded at the moment. The saving would arise in those areas where there is maximum similarity of work.

The figure of £0.5M for the move quoted in the Macklen and Stephens reports is considered still valid as an upper limit.

This scheme on its own would not permit the closure of any of RARDE Woolwich but it would ease any subsequent move of RARDE's remaining HE work. It should be noted that the move of initiator research and development work from RARDE would create an interface problem with the fuze and safety and arming designers that does not now exist. Rationalisation in one area might easily lead to an irrational situation being created in a more critical area.

Scheme 2. This scheme has been compared with the move already proposed to Fort Halstead. The main differences are in the type of building that would be used and the availability of ranges. At Fort Halstead new buildings similar to those at Langhurst are proposed. These are essentially small isolated buildings. At Aldermaston it is proposed that more substantial buildings be used which would need to be modified to render them "flash proof" and otherwise suitable for pyrotechnic work, at an estimated cost of about £100K. The total cost of a transfer of this work to Aldermaston is estimated to be no more than £200K.

There seems to be little possibility of using staff already available at Aldermaston. Pyrotechnics work is particularly hazardous and the best safeguard is a long and thorough acquaintance of junior and supervisory staff with this work. Aldermaston have no staff experienced in this work and it would be unwise therefore to assume that it would be safe to move a bare nucleus of senior staff.

It is unlikely that the desired range and burning facilities could be provided within the AWRE perimeter and the local inhabitants would be very critical of any increase in noise or smoke. A separation of the firing trials would increase the running costs, which would otherwise be much the same whether the work were transferred to Aldermaston or to Fort Halstead.

AWRE emphasised that their estimates for this scheme assumed that Scheme 1 did not proceed. Scheme 1 would take up the available buildings and in that case a "green field" site would be needed for pyrotechnics work at a cost probably greater than the Fort Halstead cost.

Scheme 3. The transfer of all production of CDB motors to ROF Bishopton is estimated to involve a capital expenditure of £615,000 on buildings, roads and services and £204,000 on plant (this excludes £120,000 for humidity control

equipment which has to be installed in any case for the existing CDB facilities). No new nitroglycerine production facilities would be required.

ROF Bishopton would need to be 'qualified' for the production of several current CDB motors which are made solely at Summerfield. This qualification cost is estimated at £800,000 spread over two or three years, but the cost might be reduced by stockpiling some types of motor in advance of the closure of Summerfield. Production costs would be expected to be similar to those at Summerfield.

The estimated capital expenditure involved in transferring IMI's R & D work to ERDE, using as many existing buildings as possible, is £450,000 on the assumption that RPE continues in existence and provides design expertise, work on hardware and motor efflux problems as well as large scale firing facilities. A reduced R & D facility could be provided at ERDE if motors of above about 400lbs propellent weight were excluded at a cost of around £400,000.

The estimate for a similar transfer to RPE, again using as many existing buildings as possible is £655,000 on the assumption that ERDE continues to provide certain back-up facilities for preparation and evaluation of ingredients and testing on chemical stability and compatibility, together with some hazard (sensitiveness) appraisal and development of new processes for manufacture as at present. The cost includes an allowance of £16,000 for the purchase and fencing of 35 acres of land, £27,000 for new office accommodation and £28,000 for the transfer and installation of specialised machines from IMI. A reduced R & D facility limited to motors of up to 400lbs propellent weight could be provided at a cost of £585,000.

The work would require a total of about 38 RDS, 38 other non industrials and 90 industrials wherever it is carried out (whether at ERDE, or at RPE, or some combination of both); some of these could be found by a redeployment of staff currently engaged at ERDE in work in support of IMI. The additional running costs would not be significantly different at either ERDE or RPE and are estimated to be about £360,000 pa.

No new estimates were made of the other non recurrent costs involved in the closure of Summerfield which were estimated by the Errington WP to be about £0.5M.

The major saving would come from the closure of Summerfield - Errington estimated that savings of approximately £0.5M pa could be made by closing IMI and the Study Group's figures are in agreement with this, assuming that production costs at ROF Bishopton would be similar to those at Summerfield.

SUMMARY OF A PAPER BY DXSW AND DR ARM ON THE COALESCENCE OF RPE AND ERDE TO FORM A SINGLE PROPULSION ESTABLISHMENT

1 The study was based on the following assumptions

a That the Establishment would be responsible for all research and development on propellents for both guns and rockets and that it would also be responsible for all research, development and design of all rocket motors required in foreseeable UK weapon and space programmes.

b That it must have appropriate facilities for experimental manufacture of such items but that bulk production would be carried out elsewhere, largely in Royal Ordnance Factories.

c That it would not be required to undertake in situ the development of motors required for missiles of the size and type of Polaris.

d That the site at Summerfield at present managed by IMI Ltd on an Agency basis would cease to be used.

e That the work now carried out in the two separate Establishments is sufficiently compatible as to permit coalescence on general safety grounds and that no insuperable problems would arise from the handling of class zz explosives on a site where rocket motor firings and tests to destruction are being carried out.

2 DRPE and DERDE each identified those of their facilities that would be needed were a new propellent/propulsion Establishment to be constructed on a "green-field" site. Each Establishment then examined the requirements listed by the other, and considered to what extent these would be met by their own facilities plus those added to them in consequence of locating a mini-Summerfield there.

CAPITAL COSTS OF TRANSFER

3 Extremely detailed figures were provided by the two Establishments and much close liaison took place between them in compiling the data. Figures for building costs at either site were calculated on the same basis. In the following sub-paras these figures have been condensed as much as possible.

3.1 Capital cost of relocation of RPE

Facilities required	Cost of provision on a greenfield site £M	Cost of provision on ERDE site £M
Test and firing sites	1.740	1.740
Laboratories (non-explosive)	0.780	0.630
Laboratories (explosive & magazines)	1.000	1.000
Offices	2.185	1.553
Utilities	1.420	0.675
Physical transfer of existing plant	0.700	0.700
TOTAL:	7.825	6.298

18/10/2022

Neither of these totals takes into account the additional absorption of Summerfield. The accommodation of the Summerfield activity was considered in detail by the Errington Working Party which, in 1968, judged that if maximum use were made of existing capital facilities £240K would need to be spent at ERDE and £30K at RPE. In the present exercise the latter figure is covered by the requirements that DRPE has stated. To cover the former, allowing for inflation but also for the fact that some of the facilities required by DRPE for his present work would also serve to carry out comparable work with motors using CDB, a figure of £200K to £250K has to be added to the total of £6.298M. The possibilities for making reductions in this figure are discussed in paragraph 4.

3.2 Capital costs of relocation of ERDE propellent work

For the purpose of this exercise DERDE confined himself to those facilities which would be required to cover propellent work as distinct from HE and materials.

	Cost of provision on a greenfield site	Cost of provision on RPE site
	£M	£M
Composite propellent facilities including proof stands, associated laboratories and offices.	0.716	0.536
Ditto for Extruded Double Base and Gun Propellents.	1.577	1.369
Ditto for Cast Double Base Propellents.	0.496	-
General supporting laboratories including facilities for making special chemicals.	0.536	0.359
Utilities	1.242	0.631
Possible repair/replacement of machines damaged during removal.	0.200	0.200
TOTAL:	4.767	3.095

(These figures include the cost of the physical transfer of plant). The zero figure for the creation of CDB facilities at RPE is a consequence of the assumption that a mini-Summerfield will have already been created there. It was judged by the Errington Working Party in 1968 that the cost of such an operation would be £496K. To cover inflation during the interim this figure now needs to be increased to approximately £650K.

3.3 Summary of costs identified in 3.1 and 3.2

The Establishments consider that it would cost approximately £6.5M to transfer RPE to ERDE and approximately £3.7M to transfer ERDE's propellent activities to RPE.

4 Sources of possible reduction in capital costs

No prospect is foreseen of making economies in the costs of transferring ERDE to RPE. With transfer in the reverse direction an economy in capital expenditure of the order of £3M would accrue if the major test facilities remained at Westcott. Such a step would also wholly eliminate any difficulties

in physical assimilation at ERDE and it would completely resolve the safety point referred to in paragraph 1(e). However, the sites are some 50 miles apart and this would be an undesirable feature. At Summerfield the firing facilities are about ten miles from the centre of operations and no loss in efficiency results, but as the distance increases so the situation deteriorates. In addition the arrangement would result in significant increases in running costs. The simultaneous transfer of materials and HE work away from ERDE would release laboratories and magazines, saving capital expenditure of about £900,000.

5 CONCLUSIONS

1 Coalescence of the two activities summarised above together with the absorption of the R&D element of Summerfield's work is physically possible in either Establishment but only with some difficulty at ERDE.

2 The capital cost of concentrating at RPE would be of the order of £3½ - £4M.

3 The capital cost of doing likewise at ERDE would be of the order of £6½M though this figure would be reduced to approximately £5½M if the HE and Materials work were removed elsewhere, when the problem of physical absorption would also be eased.

4 The capital cost figures quoted in (3) would be roughly halved if RPE were kept open as a test centre, though significant increases in running costs would accrue.

ANNEX C to
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COSTS OF POSSIBLE ALTERNATIVES TO THE IMO PROPOSALS

1 In the time available, and with many details of possible moves still to be worked out, it has not been possible to make precise estimates of costs. The following figures give a broad indication of the costs involved.

ASSUMPTION THAT THERE WILL NOT BE AN IMO AND THAT THE IMI SITE AT SUMMERFIELD WILL BE CLOSED

2 If there is no IMO and Summerfield is closed the rationalisation moves would be:-

a R & D from IMI to RPE,

b Production from IMI to the ROFs,

c Propellent work from ERDE to RPE,

d Explosives work from RARDE, Woolwich, to ERDE.

The associated costs of these moves would be:-

CAPITAL AND NON RECURRENT EXPENDITURE	£M
Transfer of IMI production to Bishopton, and qualification	1.6
Transfer of IMI R & D work to RPE	0.7
*Non-recurrent costs of IMI transfers	0.5
Transfer of ERDE propellent work to RPE (assuming nitric ester plant remains at ERDE and that CDB facilities would be provided by the IMI transfer)	2.6
Non-recurrent costs of transfer from ERDE	0.5
Transfer of part of RARDE Woolwich to ERDE	0.64
Non-recurrent costs of Woolwich transfer	0.16
TOTAL EXPENDITURE	6.7

*This includes possible payment to IMI (£35K) for loss of commercial exploitation.

CAPITAL RECEIPTS

Sale of South Site at ERDE - anything from £100,000 (agricultural land prices) to £10M or more (housing land prices).

Sale of part of Woolwich site - between £1M and £2.8M, depending on planning permission.

Sale of Summerfield site, say £0.15M

TOTAL RECEIPTS are therefore likely to be in the very wide bracket of say £1.25M - £13M.

RUNNING COSTS

The Errington Report suggested a saving of £475,000 due to the closure of IMI; some further savings might in the longer term be expected by the concentration of all the propulsion R & D on one site, offset by some £50,000 pa due to the need at RPE for additional basic chemistry facilities.

The closure of the South Site at ERDE, and of part of the Woolwich site, are likely to save around £100,000 pa and £80,000 pa respectively. Total savings are therefore likely to be upwards of £600,000 pa.

ASSUMPTION THAT THERE WILL BE AN IMO

3 If there is an IMO the alternative options are to transfer ERDE propellent work to RPE or to transfer the residue of RPE to ERDE. The associated costs of these moves would be:-

(A) Including transfer of ERDE propellent work to RPE

CAPITAL EXPENDITURE

	£M
*Setting up IMO at Summerfield) Non-recurrent costs of IMO)	3.02
ØTransfer of propellent work from ERDE to RPE (assuming nitric ester facility remains at ERDE)	3.2
Non-recurrent costs of transfer from ERDE	0.5
Transfer of part of RARDE Woolwich to ERDE	0.64
Non-recurrent costs of Woolwich transfer	0.16
TOTAL EXPENDITURE	7.52

*This includes £1M to cover the cost of royalty settlements with the Hercules Powder Company and possible payments to IMI £35K for loss of commercial exploitation but excludes the costs of acquiring additional land for the IMO (£100K) and of providing facilities for work on cast composites (£1M) and liquid propellents (£2M).

ØThis is £0.6M more than in paragraph 2 above to cover the cost of providing CDB facilities.

CAPITAL RECEIPTS

As in paragraph 2 above, less the sale of Summerfield site, say £1M to £13M.

RUNNING COSTS

No estimates have been made for the additional costs of an IMO. This is a major gap in attempting any cost comparisons.

The closure of the South Site at ERDE is estimated to save £100,000 pa. The move from ERDE would require the setting up of some basic chemistry facilities at RPE, with an addition of about 5 RDS, which would cancel out about half the savings due to the closure of the South Site. The running costs of the combined establishment at Westcott would depend on the size of the residual RPE element, but even if the RPE element were considerably reduced the combined establishment would be comparable in size to the present RPE and would not be more expensive to

run. If the RPE element remained near its present size the combined establishment would be a good deal larger than at present and some savings in overall running costs could be expected.

The closure of part of the Woolwich site is estimated to save about £80,000 pa; no significant changes would be expected in the running costs of the work transferred to ERDE.

On the production side, if it is assumed that basic costs in the IMO are about the same as in the ROFs, there would nevertheless be additional costs to HMG due to unused ROF capacity. This is estimated at about £250,000 pa.

(B) Including transfer of a small residual part of RPE to ERDE

CAPITAL EXPENDITURE

	£M
*Setting up IMO at Summerfield and non-recurrent costs of IMO	3.02
Transfer of part of RARDE Woolwich to ERDE	0.64
Non-recurrent costs of Woolwich transfer	0.16
Transfer of RPE to ERDE	0.5
Non-recurrent costs of RPE transfer	0.5
TOTAL EXPENDITURE	4.82

*See note at (A) above.

CAPITAL RECEIPTS

Sale of part of Woolwich site - between £1 and 2.8M

Sale of that part of RPE not needed by the IMO -(say) £100,000 (agricultural land prices)

RUNNING COSTS

There would be a saving due to the closure of RPE of £2.5M pa, offset by the cost of the staff transferred to ERDE, say £0.5 pa, ie a net saving of about £2M pa. But this would need to be set against the additional running costs of the IMO, on which we have no estimates.

Other running costs changes would be as in (A) above.

ASSUMPTION THAT THERE WILL NOT BE AN IMO, BUT THAT IMI WILL CONTINUE IN OPERATION, WITH THE SAME GENERAL RESPONSIBILITIES AS AT PRESENT

4 If there is no IMO and Summerfield continues as at present the rationalisation moves would be as in para 2c and d, and the associated costs would be:-

CAPITAL EXPENDITURE	£M
*Transfer of ERDE propellent work to RPE (assuming nitric ester facility remains at ERDE)	3.2
Non-recurrent costs of transfer from ERDE	0.5
Transfer of part of RARDE Woolwich to ERDE	0.64
Non-recurrent costs of transfer from Woolwich	0.16
TOTAL EXPENDITURE	4.5

*This is £0.6M more than in paragraph 2 to cover the [illegible]es

CAPITAL RECEIPTS

As in para 2 above, less sale of Summerfield site, say £1M - £1½M.

RUNNING COSTS

The closure of the South Site at ERDE, and part of the Woolwich site, are likely to save around £100,000 pa and £80,000 pa respectively.

The additional chemistry facilities at RPE, 5 RDS, would cost an extra £50,000; otherwise the cost of the transferred work would be basically the same.

There would therefore be a saving on running costs of about £130,000 pa.

THE FUTURE OF ERDE

ERDE WALTHAM ABBEY

1 The Explosives Research and Development Establishment is situated in the Lee Valley, some 12 miles from Central London, and occupies about 500 acres on two sites, which are of nearly equal size, on either side of the main East-West road and connected by half-a-mile of private roadway. Some 200 buildings with a total floor area of 340,000 sq ft are in use. Substantial areas of land are available for further development; there is an area of 20 acres at the northern end of the North Site with, nearby, a further 50 acres which are at present only sparsely used. A further 10 acres, in lots varying between 2 and 4 acres, are available within the laboratory area. Outside the security fence, and contiguous with the South Site, there are 35 acres, let at present on an agricultural tenancy but which can be recovered at short notice. On the South Site there is an area of 30 acres available for further development, including a few small scattered buildings suitable for renovation. The whole of these areas, however, are included in the Lee Valley Regional Park, and two or three major roads are likely to be constructed nearby in the next ten years. Whilst these plans will have no immediate effect on the Establishment, some re-siting of magazine facilities on the South Site may be involved, and developments in the areas presently unused or let on agricultural tenancies may be subject to negotiation with the Lee Valley Regional Park Authority.

2 The proximity of industrial and residential areas possibly limits the size of test firings and it is desirable to avoid toxic products, excessive smoke and noise; at present rocket motor firings are limited to a maximum of 200 lb charge weight. Toxic effects would limit the firings of liquid motors.

3 The Establishment employs a total staff of about 827 (including the ISRG staff but excluding constabulary), consisting of approximately 187 RDS, 175 Other Non-Industrials, 458 Industrials and 7 Apprentices. It is concerned with all chemical and chemical engineering problems of explosives, propellents and initiators, and their intermediaries. It also carries out extensive R & D work on certain classes of non-metallic materials. Because it is a discipline-orientated Establishment it is able to apply the same facilities and expertise to a wide range of related problems with considerable flexibility and economy of effort. Financially the breakdown of cost is approximately 50% on propellents, 25% on explosives, and 25% on non-metallic materials; the fractional deployment of RDS is about 41% on propellents, 32% on explosives, and 27% on materials.

THE RELATIONSHIP BETWEEN ERDE, RARDE AND RPE

4 One of the possibilities mentioned by CER when he introduced his proposals for rationalising the R & D Establishments was "the creation of larger units of management" in order to get better use of staff and facilities in both the short term and, more particularly, the long term. The creation of these larger units implies the amalgamation of existing Establishments under a single management and this in turn should provide opportunities to streamline the management and the programmes of the Establishments.

5 For such an amalgamation to be practicable the Establishments concerned should:-

a be working in closely related fields;

b already have very close technical ties;

c have programmes which are seen to be complementary,

and d if possible, be geographically not too far apart.

RARDE and ERDE reasonably fulfil all these requirements.

6 ERDE's programme is briefly described in paragraph 3 above. RARDE's programme is much larger and more broadly based technically, but a major part of the work of the Establishment is concerned with:

Explosives Development and Engineering

Propellent Applications

Materials

RPE's programme is concerned with all aspects of rocket propulsion covering all solid and liquid propellent motors with the exception of those employing cast double base.

7 The fundamental division of responsibility between ERDE and RARDE in the explosives field is that ERDE undertakes the basic research on the chemical constituents of explosives, on the compatibility of these chemicals with other materials, and on the inherent sensitivity of the explosives. RARDE, on the other hand, is responsible for the formulation of explosives mixtures for Service use, the physical and chemical properties of the mixes, the investigation and design of filling processes, and the climatic and general environmental effects on explosive stores. In addition, RARDE does development and design of explosively-filled stores for all three Services - bombs, GW warheads, rocket warheads, ammunition, etc - and is responsible for the study of explosive effects and target damage mechanisms. The programmes of the two Establishments are clearly complementary and are already subject to detailed integration.

8 The situation in the Propellents field is similar in many ways to that on Explosives, although ERDE takes the development of solid propellents rather further than is the case with explosives; moreover, the project application of the ERDE propellents falls to two Establishments - RARDE and RPE. Although RARDE is responsible for the application of solid propellents to ammunition, the main workload of ERDE in this area is concerned with RPE who are responsible for applications to GW propulsion systems and unguided rockets.

9 The Materials programmes of ERDE and RARDE do not overlap and are complementary. Essentially RARDE's Materials programme is biased towards Metallurgy with particular emphasis on steels, although there is a continuing R & D programme on organic materials. It is primarily orientated to Army requirements. ERDE's programme covers mainly organic materials and composites, but tends to be of a more basic nature than that of RARDE.

10 RARDE's Explosives, Propellents and Materials work is carried out at Fort Halstead and Woolwich, with an outstation at Potton Island for experimental explosive work and for measurement of explosive effects - blast, fragmentation, shaped charge phenomena - and target reactions. Waltham Abbey and Potton Island are north of the Thames; Woolwich and Fort Halstead are south of the Thames. These facts might appear to militate against any effective amalgamation of ERDE and RARDE, but both Establishments are quite accustomed to working with an outstation on the other side of the river and the Dartford Tunnel has considerably eased the problem of communication.

11 ERDE also houses and supports the ISRG. The work of this Group has many similarities to the work of the Internal Security Group at RARDE and has some connection with that of the Home Office Branch also at RARDE Woolwich, and there

should be no difficulty in integrating the ISRG work with that of any amalgamation of explosives work.

PROPOSALS FOR REORGANISATION

12 As set out above, ERDE's work is closely tied to that of RARDE on explosives and materials, and to RPE on rocket motors. A total amalgamation of ERDE with either RARDE or RPE would have the disadvantage that a move towards one would be a move away from the other. To avoid this, but to achieve a greater unification of the programmes in all areas, it is proposed that:-

i The propellent work which is centred on South Site ERDE, together with some ancillary work from the North Site, should be transferred to RPE where it would form a central Rocket Motor establishment.

ii Much of the explosives work of RARDE Woolwich should be transferred to the North Site ERDE, and integrated with the explosives work now undertaken there.

iii The present materials work at ERDE should be retained there and the programme closely integrated with that of RARDE, which is envisaged as the centre for Army materials R & D. This would include the small amount of work on composites, which is decreasing.

iv The whole of the North Site ERDE would then become an outstation of RARDE.

13 These moves would concentrate work on those sites of least monetary value (RPE and ERDE North Site) and release land which may be realizable for very substantial sums. The Woolwich site is known to be valuable. The ERDE South Site is classified as Green Belt and its value is less certain. However, it is served with roads and services and would realise a large sum if planning permission were given for its development. The North Site is surrounded by the Lee Valley Regional Park and is partly (110 acres) within it. It is not likely to have much development value.

14 Although transfers of managerial responsibility could be quickly arranged, physical moves would be much slower especially if a number of moves were taking place at the same time. If, as seems likely, these moves were phased over a 5-10 year period, the proposals could be effected with minimum hardship to the staff concerned. The retention of part of ERDE in a permanent form would allow explosives process workers from the South Site to be found work on the North Site, and redundancy could be kept to a minimum as about half of the 465 Industrials involved are aged over 55. The problem of training workers at RPE in propellent work would be much eased by a transitional arrangement whereby ERDE continued to operate whilst the move was built up. ERDE has 128 houses, and those made available by the move of staff from the South Site to RPE would assist the move of staff from Woolwich into the North Site.

15 Before the value of the South Site can be assessed, planning permission will need to be sought. It is essential that before this is done the staff are made aware of the whole plan so that morale will not suffer further. For this reason alone it is important to treat these proposals as a total package.

16 The staff required under the new arrangements for the present ERDE materials and explosives work would not be changed. The partial duplication at Westcott of some of the basic chemistry which would remain at Waltham Abbey would require a small increase in staff, not more than 5 RDS, giving a total increase of about 83 RDS at Westcott. It is assumed that the facilities on the North Site at Waltham Abbey would provide a service for Westcott on X-ray crystallography, and that the nitric ester plant on the North Site would be maintained so that it could be used as required.

TRANSFER COSTS

17 The estimated transfer costs, on the proposed timescale, are:-

	£M
Capital costs associated with the transfer of propulsion work from Waltham Abbey to Westcott (assuming that the nitric ester facility remains at Waltham Abbey)	3.2*
Non-recurrent costs of transfer from Waltham Abbey (including site clearance and decontamination, redundancy payments, staff transfer costs and loss of output in transitional period).	0.5
Capital costs associated with the transfer of part of RARDE Woolwich to Waltham Abbey	0.64
Non-recurrent costs of transfer from Woolwich	0.16
Total	4.5*

* Note These figures include £0.6M for CDB facilities at RPE which would in any case be needed if IMI's R & D work were to be transferred to RPE.

RUNNING COSTS

18 The closure of the South Site at Waltham Abbey is likely to save about £100,000 per annum. The move from Waltham Abbey would require an addition of some 5 RDS (paragraph 16 above) which would cancel out about half the savings due to the closure of the South Site. The running costs of the combined establishment at Westcott would depend on the size of the RPE element, but even if this were considerably reduced due to the setting up of an IMO it seems likely that the combined establishment would be comparable in size with the present RPE, and would not be more expensive to run. If the RPE element were to remain at or near its present size (115 RDS) the combined establishment at Westcott would be a good deal larger than at present and savings in overall running costs could therefore be expected. The closure of part of RARDE Woolwich, and the move of this work to Waltham Abbey, is likely to save about £80,000 per annum.

19 Summarising these changes in running costs, a saving of £130,000 per annum upwards might therefore be expected, the figure being dependent upon the size of the RPE element remaining at Westcott.

CAPITAL RECEIPTS

20 No firm forecast can be given of the value of South Site ERDE until it is known whether or not planning permission for development would be given. The bracket ranges from about £100,000 (agricultural land prices) to £10M or more (housing land prices). The value of Woolwich also depends on the nature of planning permission but is thought to be in the bracket £1M - £2.8M.

OTHER CONSIDERATIONS

21 Although the proposals above could be put into effect whether or not the Industrial Motor Organisation comes into being, they are much more attractive in the absence of an IMO as IMI Summerfield could then be closed, its R & D work transferred to Westcott and its production work transferred to the ROF organisation.

This would concentrate all intra-mural propulsion R & D work on one site and the bulk of production work in the ROFs, thereby creating an in-house capability as a viable alternative to the IMO proposal and probably at less cost.

22 If, on the other hand, the IMO were to be set up and, in consequence, the level of intra-mural work on propulsion were reduced considerably, the move of work from the South Site at Waltham Abbey to Westcott would need to be reconsidered in the light of the defined IMO proposals. Depending on the size of the residual RPE element, and on what continuing use has to be made of the Westcott facilities, it might be better to make the move in the reverse direction. Such a move would increase the size of ERDE, there would be no capital gain from the sale of the South Site, and integration with RARDE would be more difficult. There would then be three options:-

a To run the South Site and North Site as mainly separate entities, the latter being an outstation of RARDE.

b To make the whole an outstation of RARDE.

c To omit the move of the Woolwich explosives work to Waltham Abbey and concentrate on the amalgamation of the residue of RPE with ERDE.

Some explosives work might then be transferred from Woolwich to Fort Halstead. This would cost approximately twice as much as the move to Waltham Abbey and would mean that less land could be vacated at Woolwich.

23 Consideration has been given to the part which might be played by AWRE Aldermaston in the future plans for ERDE. Possibilities have been examined, both for explosives and materials work, but the conclusion has been reached that they do not offer immediate advantages. The examination showed that on the basis of AWRE's current plans there would be no worthwhile staff savings in either area. A transfer of ERDE's explosives and materials work to AWRE would weaken the strong links which currently exist with the Service branches without sufficient compensating advantages. Furthermore, the total closure of ERDE would involve costs of about £7M which would not be offset by realised land values to the same extent as the proposals above. It is clear, however, that over the years AWRE will play a wider part in defence research and development, and it is considered that the moves now proposed would not impede, and might well help, any rationalisation programme involving AWRE.

SUMMARY

24 If there were to be no IMO, the moves outlined in paragraph 12 would achieve a good measure of rationalisation with the following benefits:-

a Propulsion R & D work would become more concentrated at what is generally recognised to be the best rocket motor site in the UK.

b Explosives work would be concentrated under the managerial control of the Establishment responsible for its applications.

c Materials work would be closely integrated with that at RARDE Fort Halstead, which is envisaged as the Centre for Army materials R & D.

d The South Site at ERDE, and part of the Woolwich site, would become available for disposal, with benefits both economical and social.

The further moves described in paragraph 21 would additionally:-

e Concentrate most rocket motor production work in the ROF organisation.

f Concentrate all intra-mural propulsion R & D work.

g Make the Summerfield site available for disposal.

Managerially there would therefore be a very real gain, but for the reasons given it is not possible at present to make any exact financial assessment of the effects of the moves. It is clear, however, that there would be sizeable savings in running costs, and the possibility of offsetting the capital and non-recurrent costs by receipts from the sale of land.

25 If, on the other hand, it were decided to set up an IMO, the transfers and options set out in paragraphs 12 and 22 would need to be reconsidered in the light of the defined IMO proposals.

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