E. C. No. 455.

ESTIMATES COMMITTEE (1965-66)

NINETY-FOURTH REPORT

(THIRD LOK SABHA)

MINISTRY OF DEFENCE

(DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION)

Defence Metallurgical Research Laboratory, Hyderabad

LOK SABHA SECRETARIAT
NEW DELHI

March, 1966
Phalguna, 1887 (Saka)

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INTRODUCTION

I, the Chairman, Estimates Committee having been authorised by the Committee to submit the report on their behalf, present this Ninety-Fourth Report on the Ministry of Defence—Defence Research and Development Organisation in respect of Defence Metallurgical Research Laboratory, Hyderabad.

2. The Sub-Committee on Defence of the Estimates Committee took evidence of the representatives of the Ministry of Defence on the 27th and 28th January, 1966. The Committee wish to express their thanks to the Scientific Adviser to the Minister of Defence, Joint Secretary, Ministry of Defence (Department of Defence Production) and the Director of Defence Metallurgical Research Laboratory, Hyderabad and other Officers of the Ministry for placing before them the material and information they wanted in connection with the examination of the estimates.

3. The Committee wish to extend their thanks to Dr. D. S. Kothari, Chairman, University Grants Commission, Dr. S. Husain Zaheer, Director General, Council of Scientific and Industrial Research and Dr. R. S. Varma of Delhi University for giving evidence and making suggestions to the Committee.

4. The Committee also wish to thank Dr. D. P. Chatterjee, General Manager, Alloy Steel Project, Dr. G. P. Chatterjee, Chief Metallurgist, Durgapur Steel Plant and Dr. Brahm Prakash, Director (Metallurgy Group), Atomic Energy Establishment, for furnishing Memoranda and making useful suggestions to the Committee.

5. The Report was considered and adopted by the Sub-Committee on the 16th March, 1966 and finally approved by the whole Committee on the 21st March, 1966.

6. A statement showing the analysis of recommendations contained in the Report is also appended to the Report (Appendix VII).

NEW DELHI;
March 21, 1966.
Phalguna 30, 1887 (*Saka*).

Chairman,
Estimates Committee.

CHAPTER I

INTRODUCTORY

A. Defence Research and Development Organisation

Origin and growth of Defence R & D

1. The impact of science and technology on warfare has been, and continues to be, so enormous and pervasive that attention to science and technology has become a matter of vital concern to defence in every country today. National defence at the present time calls for the total mobilisation of the country's scientific resources and also its industrial potential. In India, the beginnings of the application of science and technology for defence purposes go back to the thirties, when, for specific purposes of purchase of stores and equipment, certain test laboratories were raised.

Setting up of a nucleus Defence Science Organisation

2. The shift of the Second World War to the eastern theatre brought in its wake technical problems connected with procurement, maintenance, storage, preservation and to some extent, modification of equipment and stores to suit local conditions and utilisation of indigenous materials. This led to the growth of Laboratories and technical establishments, particularly in the army sector, to meet specific needs. By mid-forties, these units had started on reorganisation and expansion. Defence science as such was, however, practically non-existent in India and a modest beginning was made in 1949, when alongside the technical units of the Services, a nucleus Defence Science Organisation was set up.

Reorganisation of Defence Research and Development

3. By late fifties, the need for further reorganisation and expansion of defence research and development, as well as of production and inspection activities, became increasingly manifest. The level, scope and tempo of research and development had to be raised to meet the defence needs of independent India. The next major reorganisation was effected in 1958, when a new organisation, the Defence Research and Development, was formed, initially by amalgamating the Defence Science Organisation with some of the then existing technical development establishments of the Army and the Directorate of Technical Development and Production (Air). The new organisation was administratively separate from, but otherwise

complementary to the organisation for defence production and inspection. Thus constituted, it could serve as a nucleus, around which, through a phased programme of expansion, an adequate organisation could be built up over the next few years to meet the growing scientific needs of the Armed Forces of the country.

Charter of Defence R & D Organisation

4. As a supporting establishment of the Armed Services, the Charter of Defence R & D Organisation is:—

(a) to render scientific advice to Services Headquarters;

(b) to carry out applied research to solve the problems of the Services;

(c) to design and develop weapons and equipment based on operational requirements defined by the Services;

(d) to evaluate and carry out technical trials of new weapons and equipment or those developed in the country; and

(e) to render technical guidance to civil trade for the development of new equipments.

Structure of Defence R & D Organisation

5. The Defence R & D Organisation follows the two-tier pattern as that of Service Organisation in general viz:

(a) Headquarters set up responsible for policy direction, control and coordination as well as liaison with the Services Headquarters, forming a part of the overall Defence Headquarters;

(b) a large field set up consisting of about thirty Research and Development Establishments and Laboratories located all over India.

6. The R & D units are further grouped into certain broad functional groups, with corresponding divisions at R & D Headquarters, each under a Technical Director. These broad technical divisions at present are: (a) Armaments (including instruments and metallurgy), (b) Electronics, (c) Engineering Equipment, (d) Aeronautics; (e) Defence Standardisation; (f) General Research Laboratories Group concerned with materials research, naval research, food research, physiological and psychological research, as well as research pertaining to other scientific fields of defence interest. In addition, R & D Headquarters has, attached to it, Scientific Advisers to the

three Services Headquarters and finally a Directorate of Administration. A list of R & D Establishments|Laboratories is given in Appendix I.

Headquarter's set up

7. The whole organisation is under the Director General of Defence Research and Development, who is the Chief Executive and is also, concurrently, the Scientific Adviser to the Defence Minister. He is assisted at the Headquarters, by a Chief Controller, who is a Senior Service Officer responsible for the co-ordination of Research and Development programmes with the Services and a Chief Scientist responsible for overall scientific co-ordination.

The Organisation is manned by both Civilian Scientists and Technologists and selected Service Officers. The gazetted civilian scientific personnel belong to Defence Science Service which was constituted in 1953 and is now an established Central Service with permanent pensionable posts. The Service Officers in the Organisation are on tenure basis from their parent armies/branches of Services, though a proportion is permanently retained and selected from all the three Services on the basis of their service, training and experience as well as specialised training in science and technology.

Research and Development Laboratories and Establishments

8. The Research and Development Laboratories and Establishments are headed by officers of various ranks from Principal Scientific Officers to Directors Grade I. Each of these R & D Establishments|Laboratories is responsible for research and development pertaining to an assigned range of defence equipment or an assigned area of scientific research of defence interest.

Defence R & D expenditure

9. The Committee are informed that although over the past 6 years there has been a considerable build up, yet the total magnitude of Defence R & D effort falls far short of the defence needs of the country to-day. The defence R & D effort in this country with its budget of the order of about Rs. 9 crores, constitutes a very small fraction of the total national and defence budgets.

The Defence research expenditure, as a percentage of total National Budget and as a percentage of Gross National Product for

U.S.A., U.K., U. S. S. R. and India during the year 1963-64 is given in the following table:

Defence and Defence R & D Expenditure

Country	Defence Expenditure		Defence R & D Expenditure
	As percentage of total National Budget	As percentage of Gross National Product	As percentage of Defence Budget
U.S.A.	56	11·3	15
U.K.	30	7·0	15
U.S.S.R.	52	22	15
India	38·2	5·4	1

10. The Committee would like it to be noted that while the expenditure on research and development relating to defence, expressed in terms of the total defence expenditure in U.S.A., U.K. and U.S.S.R. is 15 per cent., the corresponding figure for India is only 1 per cent. They feel that to make defence research really effective and useful, the budget allotment for research should be augmented to the extent required for reaching the take-off level.

B. Defence Metallurgical Research Laboratory, Hyderabad

Historical background

11. The Defence Metallurgical Research Laboratory is one of the chain of about thirty Defence Research Laboratories/Establishments located in different parts of the country and is intended to cater for the Defence Metallurgical requirements. The Laboratory has its origin in the Inspectorate of Metal and Steel which was formed in 1940. After the cessation of hostilities in World War II, this Inspectorate was designated as Technical Development Establishment (Metallurgy), with two detachments one at Katni and the other at Muradnagar under its administrative control. On the formation of the Defence Research and Development Organisation in October, 1958, this Establishment was re-designated as the Defence Metallurgical Research Laboratory with a dual function of research and development and inspection. With the formation of the Chief Inspectorate of Metals at Ishapore in October, 1963, the Inspection Division was separated from Defence Metallurgical Research Laboratory which became an exclusive research and development laboratory at Ishapore. The Laboratory was subsequently positioned in a phased programme at Hyderabad in early 1964.

CHAPTER II

ORGANISATION AND FUNCTIONS

A. Functions

12. Defence Metallurgical Research Laboratory is an Inter-Service Organisation for research and development on metals and alloys. Its functions are:

(i) to deal with various defence metallurgical problems in the field of weapons ammunition, vehicles, communications, general, general stores, instruments etc.;

(ii) to undertake small-scale manufacture of different strategic stores which cannot be produced in the country for various reasons and undertake research work for development of 'know-how' of processes;

(iii) to undertake research and development work on high temperature alloys, substitution, etc.;

(iv) to undertake investigations of failures in services;

(v) to provide an adequate Test House for all inspection activities;

(vi) to collaborate with National Laboratories on researches aimed at attaining self-sufficiency for Defence requirements;

(vii) to investigate problems associated with production failures, prematures, etc. and to suggest ways and means for avoiding such defects in production and/or usage;

(viii) to undertake problems on standardisation of material specifications and preparation of standards;

(ix) to provide adequate training in Defence Metallurgy to officers and staff; and

(x) to design test equipment.

B. Organisation

Organisational set up

13. The Defence Metallurgical Research Laboratory is at present headed by a Director Grade I. A chart showing the organisational set up of the Laboratory is given in Appendix II.

(a) HEADQUARTERS, DMRL

Shifting of the Laboratory

14. The Defence Metallurgical Research Laboratory is at present located at Hyderabad. The Laboratory was previously located within the precincts of the Metal and Steel Factory, Ishapore and was shifted from Ishapore to Hyderabad between September, 1963 and May, 1964 in a phased programme. The Committee are informed that at the first meeting of an *Ad hoc* Expert Committee set up by the R. & D. Organisation to examine the facilities at the Defence Metallurgical Research Laboratory on the 9th December, 1960, it was observed that the accommodation at Ishapore was absolutely inadequate and was not properly designed for a Laboratory of the importance of Defence Metallurgical Research Laboratory. The location of the present Laboratory inside the Metal and Steel Factory was not also conducive for creating an atmosphere for research and development work. The Committee stressed the great necessity for expanding and equipping the Laboratory with equipment and staff so that the most important work on research, development, production and control of Defence Stores could be given the top most priority. The Committee also recommended that this nucleus of research and development Laboratory should be shifted to a more suitable site. It is stated that before coming to a decision regarding the site, suitable areas were looked for in and around Ishapore, Kanpur and one or two places in Orissa. Ultimately the Defence Research and Development Council agreed to the proposal to shift Defence Metallurgical Research Laboratory from Ishapore to Hyderabad at its sitting held on the 20th February, 1963. The following factors were taken as a guide to choose a suitable site:

(i) Central location so that it could serve the requirements or the problems posed by the Users, i.e. Ordnance Factories, Tank Factories, Avadi, Mazagon Docks, Aircraft Industry and Electronic Industry;

(ii) Easy accessibility by air from Calcutta, Bombay, Madras, Delhi, Vizag, Bangalore etc.;

(iii) Availability of a fairly large size building pending construction of new laboratory buildings.

(iv) Availability of residential accommodation for staff pending construction of quarters;

(v) Availability of a large compact piece of land of an area of over 200 acres.

(vi) Assured supply of electric power and water.

15. Subsequently, after taking into consideration all the information that had been gained, it was found that the site at Kanchenbagh in Hyderabad would be most suitable and the Government gave their approval for shifting Defence Metallurgical Research Laboratory from Ishapore to Hyderabad.

The site afforded the following facilities:—

(i) The Andhra Pradesh Government offered suitable land free of cost and stated that water and power facilities would be made available.

(ii) Big buildings near the site were available on hire to shift the R. & D. side of DMRL till such time as the laboratory buildings were built up. This enabled the R. & D. side of Defence Metallurgical Research Laboratory to continue work in hired building in Hyderabad.

(iii) Since R. & D. Organisational had already two other laboratories in that area, common facilities for the three could be integrated.

(iv) Residential accommodation was also comparatively easy to obtain in the town.

The move was effected between September, 1963 and May 1964 as per phased programme.

The expenditure incurred on the move including Military Credit notes was Rs. 69,045·98.

16. The Committee are not fully convinced with the reasons advanced for shifting the Laboratory from Ishapore to Hyderabad. They realise that the accommodation then available at Ishapore was inadequate particularly for the needed expansion and development of the Laboratory. Yet the Committee feel that before deciding the change hastily and before shifting the equipments from Ishapore, the Government should have considered among other things (i) the locational advantage likely to be achieved from the proximity of [illegible]**al**

and metallurgical industries (ii) the dislocation to be caused in the research and development work undertaken in the Laboratory, (iii) benefits rendered to and to be derived from Ordnance Factories near Ishapore (iv) the availability of proper accommodation at Hyderabad for putting the equipment and machinery to use and to avoid keeping these idle for a pretty long time; and (v) provision of power, water, residential quarters etc.

The Committee consider that in locating the Defence Metallurgical Research Laboratory at Hyderabad, the Government should have ensured the prompt provision of the pre-requisites of the Laboratory e.g. proper accommodation, power, water etc. This deserved special consideration because of the shifting taking place after the Chinese aggression which made it imperative to avoid any suspension of and dislocation in the work of defence research. At any rate if the Defence Metallurgical Research Laboratory had been allowed to remain at Ishapore the dislocation of work during the emergency consequent upon the shifting of the laboratory would have been avoided during the emergency. The Committee, however, recommend that in future Government should give careful thought and consideration to all aspects and also lay down definite criteria before finally deciding upon the location of the Defence R. & D. Laboratories/Establishments.

(b) DEFENCE METALLURGICAL RESEARCH LABORATORY CELL, ISHAPORE

Setting up of DMRL Cell at Ishapore

17. Subsequent to the bifurcation of the composite Defence Metallurgical Research Laboratory and shifting of the Research and Development Wing to its new location at Hyderabad, a Defence Metallurgical Research Laboratory Cell has been set up at Ishapore. The Cell is headed by a Deputy Director (Director Grade II) and came into existence in January, 1964. The functions of the Cell as laid down by the Director, Defence Metallurgical Research Laboratory are as follows:—

(i) To carry out development work on projects (including short term and study projects) allotted/approved from time to time by Headquarters, Defence Metallurgical Research Laboratory;

(ii) Liaison with Ordnance Factories located at Ishapore and Cossipore on development projects of the R & D including defect analysis of prototypes being manufactured by these factories and rendering suitable metallurgical advice to these factories;

(iii) To explore possibilities of undertaking development work (both of long and short term nature) based on problems arising in the Ordnance Factories and Defence Establishments of this sector and to feed all relevant information to the Headquarters Defence Metallurgical Research Laboratory along with specific proposals, if any,

(iv) To keep close liaison with Director General of Ordnance Factories located at Calcutta and advise Headquarters Defence Metallurgical Research Laboratory regarding metallurgical help required by Director General of Ordnance Factories and to appraise Director General of Ordnance Factories in turn on the help that can be rendered by this Laboratory (DMRL);

(v) To keep close liaison with local private industry and trade so as to assist development work at Ishapore and Hyderabad;

(vi) To assist Headquarters Defence Metallurgical Research Laboratory in local purchase and procurement of stores available locally at Calcutta;

(vii) To undertake at the instance of the Headquarters Defence Metallurgical Research Laboratory on as required basis, Pilot Plant Production of Defence stores already developed;

(viii) To carry out Metallurgical Investigations of metals and alloys of Defence stores referred to by the local Defence Organisations with a view to identify the materials and to suggest on as required basis alternative or better materials along with the methods of shaping and heat-treatment adopted; and

(ix) To carry out any other assignment given by the Director, Defence Metallurgical Research Laboratory, from time to time.

Reasons for the retention of the Cell

18. The following reasons have been adduced by the R. & D. Organisation in justification for retaining the Cell at Ishapore:—

(a) To meet previous commitments of Defence Metallurgical Research Laboratory; and

(b) to cater to the metallurgical needs of the Ordnance Factories in Calcutta and around.

19. During evidence the Scientific Adviser has stated that about 90 per cent. of the commitments have since been fulfilled by the Cell. Besides the two major projects viz. (i) the production of Copper Crusher Gauges and (ii) the development of barbed tape, which were entrusted to the Cell, have almost been completed.

Asked as to whethe it was proposed to retain the Cell permanently or not when the tasks assigned to it had been completed, the Scientific Adviser replied that the matter had not been examined yet but he felt that the Cell would have to continue in some form or the other.

Cell not adequately equipped

20. During their recent visit to the Defence Metallurgical Research Laboratory Cell at Ishapore, the Sub-Committee on Defence have noted that the Cell is not adequately equipped and has no facilities and as such is hardly of any use to the Ordnance Factories located in and around Calcutta or to the Director General of Ordnance Factories. Besides the liaison between the Cell and Ordnance Factories is poor and even if a problem has to be referred to the Cell it has to be done through the Director, Defence Metallurgical Research Laboratory, Hyderabad, which obviously entails delay. The Committee feel that this may be due to the fact that the Cell neither enjoys any status nor any authority to deal with matters directly with the users.

The Scientific Adviser has admitted during evidence that the inadequacy of equipment and other facilities available at the Cell as also its inability to be useful has similarly been brought to his notice by some scientists and the users. He assured the Committee that he would look into the matter and remove these shortcomings.

21. The Committee have been informed that a Cell at Ishapore can be of great use and help to the Ordnance Factories near about Calcutta and also to the Director General, Ordnance Factories if the Cell is properly provided with necessary equipment and authority.

The Committee consider it unfortunate that the Government had not given due consideration to these important matters at the time when the decision was taken to retain a Defence Metallurgical Research Laboratory Cell at Ishapore. They feel that if the Cell is expected to fulfil the tasks assigned to it, the question of providing the necessary equipment and facilities as also the authority and status may be examined by Government at a very early date. The Com-

mittee hope that Government would examine the whole matter without further delay as assured by the Scientific Adviser so that the Cell at Ishapore is of real help to the users.

Staff Strength of the Cell

22. At present the total strength of the Cell is 66 including thirty industrial employees and five officers who are all technical personnel. As the staff requirement of the Cell is included in the overall staff allocation made to Defence Metallurgical Research Laboratory, there is, therefore, no separate authorised strength for the Cell. It is stated that the staff requirements of the Cell are assessed on the basis of the work load assigned to it from time to time.

Annual Expenditure

23. The total expenditure incurred by the Cell during the year 1965 was Rs. 3,46,800. There is neither a separate budget for the Cell nor any separate sub-allotment of budget is made for it. The Committee are informed that when the composite Defence Metallurgical Research Laboratory was located at Ishapore, the Pay and Audit authority for the Laboratory was C.D.A. (Factory), Calcutta. Subsequently when Defence Metallurgical Research Laboratory was shifted to Hyderabad, it came under the accounting authority of C.D.A. (Southern Command), Poona. As the Cell is a part of the Defence Metallurgical Research Laboratory, it is under the control of C.D.A. (Southern Command), Poona for accounting purposes.

The Committee are not satisfied with the present arrangement which leads to a great deal of administrative delay, difficulties in the discharge of the allotted work and consequent inconvenience to the staff. The Committee understand that unless all accounting documents are countersigned by the Director, DMRL, Hyderabad, they do not have any validity in the eyes of C.D.A. (Southern Command), Poona. The Committee have been surprised to learn that the accounts of the Cell, which is so near to Calcutta, have to be audited by the C.D.A. (Southern Command), Poona and not by the C.D.A. (Factory), Calcutta. They recommend that all these matters may be examined by the authorities concerned at an early date and suitable steps taken to eleminate unnecessary hardship to the staff, difficulties to the administrative authorities and handicaps to the smooth working of the Cell.

(c) DMRL Advisory Committee

Composition and Functions of D.M.R.L. Advisory Committee

24. The Defence R. & D. Organisation has constituted a number of specialised Committees and Panels which seek to bring the designer, the user, the producer and the inspector together to advise on formulation and execution of research and development programmes in specific fields and to review periodically the work carried out in these fields by the R. & D. Establishments/Laboratories concerned. The Defence Metallurgical Research Laboratory is advised in relation to its programme of work and activities by the Defence Metallurgical Research Laboratory Advisory Committee. The composition and functions of this Committee are as follows:—

Composition

Chairman 1. Chief Controller. Research and Development.

Members 2. Director, National Metallurgical Laboratory. Jamshedpur.

3. Superintendent, Metal and Steel Factory, Ishapore.

4. Chief of Laboratory and Metrology, Hindustan Aeronautics, Ltd.

5. Head of Metallurgy Division, Atomic Energy Establishment.

6. Director of Armaments, Research and Development Organisation.

7. Director, Defence Metallurgical Research Laboratory.

8. Director, Indian Institute of Technology, Madras. (1965).

Functions

(i) To scrutinise Defence Metallurgical Research Laboratory requirements of equipment, accommodation and staff and to make recommendations regarding their augmentation as considered necessary, keeping in view the nature and load of work assigned or proposed to be assigned to Defence Metallurgical Research Laboratory.

(ii) To study progress of work on major projects which the Scientific Adviser to the Defence Minister or Chief Controller, Research and Development may desire the Committee to look into and to advise on how best to execute such projects expeditiously.

Private sector industry not represented on the Committee

25. The Committee note that at present the private sector industry has not been represented on the Committee. Even the representative of the University viz., Director, Indian Institute of Tecnnology, Madras, was included in the Advisory Committee as late as in 1965. The Scientific Adviser to the Defence Minister has stated that at present there is no necessity to have a representative from the private sector industry on the Committee but they might have one in due course.

The Committee consider that it will be advantageous to secure the advice and experience of the best talents available in the country for the Advisory Committee in the interest of the Laboratory as a whole. They, therefore, suggest that the desirability of having a specialist from the private sector industry on the Defence Metallurgical Research Laboratory Advisory Committee may be considered by the Government as such a representation will ensure an independent and critical approach to a problem, which can as well act as stimulant to the work of the Laboratory.

Meetings of the Committee

26. The Committee are informed that the Defence Metallurgical Research Laboratory Advisory Committee met only twice during the last three years. The Committee met only once in April, 1963 and May, 1965. No meeting of the Committee could be held in 1964 due to the pre-occupation of the Laboratory in shifting and setting up at Hyderabad. While five out of seven members attended the meeting of the Committee held in April, 1963, only four members attended the meeting held in May, 1965.

The Committee further note that the authorised frequency of meetings is "not more than twice a year".

The Committee do not feel happy about the above position. They consider that if the Defence Metallurgical Research Laboratory Advisory Committee is to fulfill its objectives with which it has been set up, the Advisory Committee should meet more frequently in future. The Committee feel that the rule regarding the frequency of the meeting of any Advisory Committee should indicate the

minimum number of meetings in a year rather than put a ceiling on the number as has been done in the present case—"not more than twice a year".

The Committee hope that the matter will be examined by Government at an early date.

(d) GOVERNING COUNCIL

Governing Council for each Laboratory/Establishment

27. The Committee are informed that the question of the right kind of internal organisation and management for institutions and laboratories concerned with scientific research was considered by the Scientific Advisory Committee to the Cabinet in 1964. The Committee felt that the ordinary organisation of government departments and offices was not suitable for research institutions and laboratories; and that the organisation and procedures of the research institutes and laboratories should be such as to enable those bodies to carry on the work of scientific research and development with the maximum of efficiency and the minimum of administrative red-tape. The Committee accordingly drafted a model constitution containing the general principles which should govern the internal organisation of all scientific Institutions and Laboratories. The general principles contained in the Model Constitution have been approved by the Cabinet for adoption by government Institutions and Laboratories concerned with scientific research.

Model Constitution and role of the Governing Council.

28. The Model Constitution provides for a Governing Council for each Institution and Laboratory which should be the highest executive body of the Institution. The role of the Governing Council, as envisaged, is to consider and approve the programmes of the Institution within the scope of the prescribed objectives of the Institution and within the scope of its budget and to see that they are implemented. The Governing Council will scrutinise plans for developments; consider, approve and operate the budget; and make the appointments.

29. During evidence the Scientific Adviser has stated that the proposed Governing Council should be vested with full powers to deal with the running of the Defence R. & D. Laboratories and to handle policy problems. The comments of Defence R. & D. Organisation on the proposed model constitution have been forwarded

to the Ministry of Defence and are at present under their active consideration.

In view of the fact that the functions and activities of the various Research and Development Laboratories/Establishments have increased considerably, the Committee are of the view that the appointment of a Governing Council as envisaged in the Model Constitution for each major R. & D. Laboratory/Establishment would be a step in the right direction. The Committee feel that this arrangement will help the Laboratory in selecting the research projects and in promoting expeditious completion of research projects assigned to them and in administrative work so that the Director and other research workers will find more time to devote to technical and scientific work. The Committee hope that an early decision will be taken.

(e) PERSONNEL MATTERS

Staff Strength

30. The latest category-wise authorised and actual staff strength of the Laboratory is as given below:—

Category	Authorised Strength	Present Strength	Vacancies
Gazetted/Commissioned Officers .	79	49	30
Scientific/Technical . . .	152	108	44
Non-Technical	187	157	30
Total	418	314	104

31. It will be noted that as against the total authorised staff strength of 418, only 314 persons *i.e.* 75% are on the actual strength of the Laboratory. Further as against the authorised establishment of 79 Gazetted Officers and 152 Scientific Technical staff, the actual strength of the Laboratory is 49 and 108 *i.e.* 65% and 71 per cent in these categories respectively. Obviously the shortfall in the staff strength is more marked in these two categories as compared to the staff position of non-Technical staff.

Reasons for Shortfall in Staff Strength

32. As regards the reasons for not filling up these posts, the Scientific Adviser has stated that this is due to two main reasons.

Firstly there is a shortage of metallurgists in the country and secondly the organisation has to approach the UPSC and observe certain formalities for recruitment of staff which entail delay. Besides the pay scales and facilities offered to the candidates by Defence R. & D. Organisation are not attractive as compared to those offered by the private sector industry and foreign firms. The Scientific Adviser stated that he would certainly wish to have a full complement of staff to carry on the normal work of the Laboratory.

The Committee partly agree that the shortage of properly equipped technical and scientific research personnel in the Defence R. & D. Laboratories/Establishments is due to the general shortage of technical and scientific staff in the country. In this connection, they would like to refer to the information given by an eminent Metallurgist that the country is not short of technical and scientific staff but what is lacking is the machinery which can locate and recognize talents and take good care of them and enthuse them with confidence for nation building tasks. The Committee feel that the scientists in the country do not have proper encouragement and facilities to pursue advanced studies. Besides they have to work under great handicap on account of bureaucratic rules and procedures. Because of this, some of the best brains of the country go abroad and in many cases settle there out of a sense of frustration and the Committee think that this drain of the scientific talents of the nation should be checked at an early date. In the Committee's view at least a partial remedy lies in the improvement of conditions of work including the facilities in the research Laboratories and salaries. The Committee recommend that concerted efforts should be made by Government to locate scientific and technical talents in the country by offering them all possible facilities and better career prospects. They further recommend that as a long term measure to remove the shortage in the supply of properly trained scientist and technologists, the Defence R. & D. Organisation, the Council of Scientific and Industrial Research and the Education Ministry should make an assessment of the nation's requirements of scientists and technologists for each plan period and to make the necessary arrangement for their training within the country and if necessary also abroad.

33. In this connection the Committee would like to observe that while the Defence Metallurgical Research Laboratory Cell has some experienced technical officers on its strength who do not have full time work; the Headquarters Defence Metallurgical Research Laboratory at Hyderabad has a number of young scientists with little experience. **The Committee suggest the desirability of providing adequate training for these young scientists so that they can undertake serious research in as short a time as possible.**

Norms of work for the staff

34. It is stated that it is difficult to specify norms of work for various categories of staff in a research Laboratory due to inherent nature of work. The work goes on varying and is generally not repititive, but staff requirements are assessed on the basis of the specialised nature of the work.

It is evident that no systematic norms of work load have so far been laid down for any categories of the staff. The Committee consider that fixing of such norms is very essential for efficient and economical utilisation of staff. They recommend that steps should be taken by the Defence R. & D. Organisation to determine, as far as possible, the norms of work for all categories of staff particularly for the non-technical staff and to reassess and rationalise the staff strength of all R. & D. Laboratories/Establishments accordingly.

Powers of the Directors

35. A comparative statement showing some of the administrative and financial powers of the Directors of R. & D. Establishments/ Laboratories *vis-a-vis*, those of the Heads of the Laboratories under C.S.I.R. and Atomic Energy Establishment, Trombay is given in Appendix III.

36. It will be noted from the statement that while the Directors Grade I of Defence R & D Laboratories have powers to sanction purchase of stores and equipment casting upto Rs. 10.000 per item, the Heads of Laboratories under C.S.I.R. have powers to sanction purchase of stores and equipment costing upto Rs. 50,000/- in each case. In the case of Laboratories under Atomic Energy Establishment, Trombay, the Heads of the Laboratories have full powers in the matter of purchase of stores and equipment. Similarly the administrative power enjoyed by the Heads of Laboratories under C.S.I.R. and Atomic Energy Establishment, Trombay are much more than the powers at present enjoyed by the Directors of Defence R & D Laboratories and Establishment.

Powers not considered adequate

37. The Committee are informed that the existing administrative and financial powers of the Director, Defence Metallurgical Research Laboratory are not considered adequate. During evidence the Scientific Adviser has stated that the Directors of the various Laboratories/Establishments should be invested with more powers as they have to look after the day to day working of the Laboratories.

The Committee entirely agree with the Scientific Adviser. With a view to avoid delays and also in the interest of the smooth and efficient functioning of the Laboratories, the Commitee recommend that the desirability of raising the powers of the Directors Grade I of the Defence R & D Laboratories/Establishments to bring them at par with those of their counterparts in C.S.I.R. may be examined by Government.

Training of Personnel

38. The Committee are informed that the recruitment of personnel for the Laboratory is mainly done from metallurgical graduates and diploma holders. These personnel where necessary are given a defence orientation by sending them to farward areas to acquaint themselves with the problems arising out of high altitude and sub zero temperatures. In addition, the different training schemes arranged by Defence Metallurgical Research Laboratory are as follows:—

(i) Intensive courses in Metallurgy for scientific and technical staff of the Laboratory are arranged. Some of the personnel trained have appeared for the examination of the Indian Institute of Metals. It is proposed by the Laboratory to continue these courses.

(ii) The French Government have agreed to train 15 technical and scientific personnel from the Defence Metallurgical Research Laboratory every year for the next 5 years in advanced metallurgical techniques in French industries and Laboratories. This training would be for a period of one year and the expenses of their stay in France would be met by the French Government. A batch of 5 persons has already been sent to France and a batch of another ten persons will be sent shortly.

(iii) The Laboratory is also arranging to send some of its personnel to outside Institutions in India for getting them trained in courses which are of relevance to the activities of the Laboratory. The Laboratory has sent persons regularly to the Atomic Energy Establishment for its course on 'Safety aspects in the industrial application of radio-active sources.'

(iv) Besides new/comers are also sent for training at the Institute of Armament Technology, Poona, National Metallurgical Laboratory, Jamshedpur and in some cases to the

Aluminium Industries because these industries are particularly connected with the type of work done at the Defence Metallurgical Research Laboratory.

The Committee cannot over emphasise the importance of well designed training schemes for a Laboratory which is engaged in the research and development of defence metallurgy. They suggest that closer coordination should be maintained with the training schemes of National Metallurgical Laboratory, Atomic Energy Establishment and other private and public sector undertakings, with a view to take full advantage of their experience in the same field. The Committee also recommend that as far as possible, some of the scientists and technologists of the Laboratory should also be sent to Ordance or other allied factories in the country for short periods in order to familiarise themselves with the manufacturing problems.

Residential accommodation for the staff

39. The Committee note that no residential accommodation has so far been provided to the staff of the three Laboratories *viz.* Defence Metallurgical Research Laboratory, Defence Research and Development Laboratory and Defence Electronics Research Laboratory, located at Hyderabad. It is stated that a provision had been made in the Five Year Plan of Budgetary Requirements of the Laboratories for the construction of residential accommodation for the staff but that the project has since been deleted and dropped by the Government due to financial stringency.

The Committee are surprised to note that residential accommodation has not so far been provided to any member of the staff of the Defence Laboratories at Hyderabad although these are located at a distance of 7—8 miles from the city and the intervening area is not also inhabited. During their visit to Hyderabad in October, 1965, the Defence Sub-Committee of the Estimates Committee noticed that there were no proper transport arrangements for the conveyance of the staff from and to the city. The Committee realise that due to financial stringency at present, it may not be possible and advisable to undertake a programme of constructing residential quarters. Nevertheless they consider that for efficiency of work steps should be taken by the Organisation to arrange a proper bus service preferably with the help of the State Government or with the local transport authorities so that the staff working in the three

laboratories, namely—Defence Metallurgical Research Laboratory, Defence Research and Development Laboratory and Defence Electronics Research Laboratory is not put to any inconvenience. The Committee hope that an early action will be taken in the matter.

(f) Accommodation for the Laboratory

Accommodation for the Laboratory

40. The Laboratory is at present housed temporarily in the buildings which have been rented at about Rs. 2000/- per month. Besides some Sections of the Laboratory are housed in tents. A comprehensive scheme regarding provision of permanent buildings at an approximate cost of Rs. 1.88 crores for housing Laboratory Pilot Plants and technological departments was prepared and approved by Government. A phased programme had been evolved for the project and it was expected that the buildings and the Laboratory would be in a fully working condition in about three years time.

41. The Committee are now informed that due to the present emergency, the Government had asked the Ministry of Defence to reconsider the project. Due to the restrictions imposed by Government, buildings for housing Laboratory Pilot Plants, technological departments and workshops for the present would only be built. The construction of administrative and residential buildings would be held up for the time being. In view of this, a part of the buildings for Laboratory would now not be built in three years as envisaged by the engineers.

The Committee find that although the decision to shift the Laboratory from Ishapore to Hyderabad was taken as early as in February, 1963, not much advance planning had been done in the matter of provision of permanent accommodation for this Laboratory. They feel unhappy that sufficient vigour has not been shown in dealing with this problem. The Committee recommend that every effort should at least now be made to complete the buildings for the Laboratory as early as possible as the delays in such cases invariably increase the estimated cost of the projects and adversely affect the output of research work of the Laboratory.

C Budget Estimates

(a) Budget Estimates and actual expenditure

Budget Estimates and actual expenditure.

42. The table below indicates the comparative position regarding the estimates and actual expenditure of the Laboratory during the last three years:—

(Rs. in lakhs)

Year	Proposed Estimates	Allotted	Actual expenditure.
1963-64	72·46	42·10	37·79
1964-65	74·80	30·00	24·94
1965-66	120·44	42·81	32.25 (for 10 months i.e. 1st April, 65 to 31st Jan., 66)

Shortfall in expenditure

43. It will be seen from the above statement that there has been a shortfall in expenditure during the years, 1963-64 and 1964-65. The reasons for the shortfall of expenditure during these years, are stated to be as follows:—

(i) Due to non-availability of suitably qualified candidates, the authorised staff strength of the Laboratory could not be completed during these two years;

(ii) The Laboratory was not able to take up most of the important development and study projects during the two years and hence there was concurrent shortfall in respect of the expenditure under Central and local procurement of equipment and stores; and

(iii) The forecast budget estimates each year are prepared on the basis of the probable requirements under the various budget heads. Usually the full estimated amounts under the various budget heads are not allotted by the R & D Headquarters as the funds are allotted keeping in view the overall requirements of the various R & D Establishment.

The Committee are not convinced by the reasons advanced for the shortfall in expenditure. They are concerned over such short-

falls. The Committee feel that such shortfalls at the end of the year do not reflect well as such shortfalls in expenditure will mean shortfall in development and research work also. They trust that the Laboratory would be more careful in future in preparing its budget estimates in a realistic way. Having budgeted for a certain amount the Laboratory should ensure that the funds are fully utilised in a planned and economic way.

(b) FOREIGN EXCHANGE

Limited availability of foreign exchange.

44. The Committee are informed that foreign exchange available for the procurement of basic facilities required by the various R. & D. Laboratories/Establishments has throughout been limited. During evidence, the Scientific Adviser has stated that the position has been practically difficult at present due to the emergency. The representative of the Ministry of Defence also added that scarce foreign exchange is given as a totality to the Ministry of Defence out of which the Department of Defence Production is given a certain amount within which it has to meet the varied requirements of Defence R. & D. Organisation and other units. Further the Department of Economic Affairs of Ministry of Finance has not delegated the power to any body except the Secretary of the Department and all foreign exchange requirements have got to have his sanction. The Chief Controller, Research and Development also added that for spending foreign exchange, the organisation has to go through a very involved procedure.

45. The Committee understand that certain powers had been earlier delegated to the Chief Controller, R. & D. and the Joint Secretary, Department of Defence Production, Ministry of Defence, regarding the allocation of foreign exchange but these have since been withdrawn due to the present emergency.

The Committee appreciate the difficulties encountered by the Defence R. & D. Organisation regarding the release of foreign exchange. They feel that the present procedure for allocation and sanction of foreign exchange for procurement of equipment and stores etc. by the Defence R. & D. Establishments/Laboratories is cumbersome and time consuming and needs to be simplified. The Committee recommend that the matter may be examined by Government at an early date.

(c) COST ACCOUNTING

46. It is understood that the costing of R. & D. Projects is at present confined to booking of direct cost i.e., cost of materials, equip-

ment and facilities required for a specific project in addition to cost of services requisitioned from outside agencies. The system of cost accounting is, however, not in vogue in the Defence R. & D. Establishments/Laboratories. During evidence, the Scientific Adviser has stated:—

> "Cost accounting for the whole laboratory or in the whole of R. & D. particularly where one is involved in research or development of new techniques, is not possible. I have given some thought to this and at the last Conference of Research and Development Directors, I suggested that they should pick out four or five specific projects and introduce cost accounting for a specific product. This is under experimentation. If we could do that, then we can do that for the pilot plant project."

The Committee note that the question of introducing cost accounting in some form is already engaging the attention of the R. & D. Organisation. They recommend that steps should be taken to make cost accounting a reality so as to enable the R. & D. Organisation to exercise effective control over the operational expenses of the Laboratories/Establishments.

CHAPTER III

RESEARCH AND DEVELOPMENT PROJECTS

A. Planning and formulation of R. & D. Projects

Agencies involved in Defence R & D task.

47. There are usually four main agencies directly involved in the Defence Research and Development task. They are (a) the Services; (b) R & D Organisation; (c) the production agencies and (d) the Inspection Organisation. At any given stage of research and development usually one of these agencies acts as the principal and the other three as close consultants. There is no single system of processing which is applied to defence R & D Projects between their conception and the moment they become the basis of a bulk production order. The procedure varies to an extent from one group to the other depending upon the nature of its function, but all R & D Projects pass through certain well defined stages which are generally common to all of them.

Definition of R & D Projects.

48. A development project implies research and/or development work which is required to be carried out as a set piece task for achieving specific objectives within specified time and material resources. There are two main categories of projects as under:—

(a) RESEARCH PROJECTS

A research project may relate to basic or applied research. Research Projects undertaken by the Defence R & D Organisation generally aim at the evolution of a new technique or solution of a problem, and are aimed at assisting the efforts of Development Establishments in the Organisation. In addition, research projects may also aim at finding solution to the specific physiological/psychological/logistic and other allied operational problems of the Service.

(b) DEVELOPMENT PROJECTS

A development project is defined as an undertaking either to develop a new equipment or material, or to modify/improve an existing equipment to suit Services requirements or to solve certain design problems in establishing indigenous production of an existing

equipment/stores or to carry out a technical appraisal of a new equipment/store to assess its suitability to meet Service requirements.

Initiation of R & D Projects.

49. All major R & D Projects are initiated by the Services Headquarters concerned through the Staff Committees *viz.*, General Staff Equipment Policy Committee, General Staff Equipment Policy Sub-Committee and Modification Sub-Committee which also have nominees of Research and Development, Inspection and Production Organisation as members.

In addition, R & D Projects are also initiated at various levels in the R & D Organisation itself as auxiliary projects in support of the main R & D Projects undertaken on behalf of Services Headquarters.

B. Technical and Financial Control

Technical Control.

50. The Establishment responsible for a particular project forms a project team which is responsible to the Head of the Establishment/Laboratory for execution of the project. The Directors of Establishments/Laboratories and the Headquarter's Technical Director concerned maintain a close watch over progress of their projects. There are a number of R & D Panels and Advisory Committees which consider and review the progress of R & D Projects in hand in the various Establishments Laboratories. These panels and committees are composed of representatives of the designers (*i.e.* R & D Organisation), the manufacturers (*i.e.*, the Production Organisation), the Inspection Organisation and the User Services and also, wherever necessary, representatives from other appropriate scientific/technical bodies in the country. In the case of certain major projects, special *ad hoc* Steering Committees are created which maintain a close watch on the progress of these projects. Progress on selected R & D Project is also reported to the Executive Committee of the R & D Council and the R & D Council.

Financial Control

51. For each R & D Project, for undertaking which a decision has been reached, a formal sanction of the competent authority is issued. The competent authorities for sanctioning an R & D Project are fixed on the basis of the 'Cost' of projects and and are defined by Govern-

C. R. & D. Projects undertaken by the Defence Metallurgical Research Laboratory

Projects entrusted to DMRL

52. The total number of projects at present entrusted to Defence Metallurgical Research Laboratory are as follows:—

(i) Development projects—16

(ii) Study Projects—30.

Total—46

Besides these projects, there is one emergent project on 'Re-utilisation of Brass Scrap' arising out of fired cartridge cases.

53. The number and details of the projects which are in progress for more than 3 and 5 years in the Laboratory are as follows:—

(i) *Project more than three years old.*

(a) Experiments in small scale production of Magnesium Metal.

(ii) *Projects more than 5 years old.*

(a) Small arms ammunition—use of light alloy cases;

(b) Indigenous production of Copper Crusher Gauges—Type 'G' MK1.;

(c) Establishment of indigenous manufacture of lead crusher gauges;

(d) Indigenous production of copper crusher, Type 'D' MK1; and

(e) Indigenous production of copper crusher gauges, Type 'A' MK5.

The projects mentioned above are at different stages of development.

Target dates for completion of Projects

54. The Committee are informed that target dates for completion of the projects are fixed. Further a procedure has been evolved by which any project which is more than three years old, is examined at various levels and the date of completion is extended and revised if there is a reasonable chance of fulfilling the objectives of the project or otherwise the project is closed down. The projects are generally dropped due to lack of technological facilities and not so much

due to lack of technical know-how. It has been further stated that the average time taken for the development of a project depends on the facilities available at the laboratory. There are three or four projects which have been closed down after having been taken up for period varying five or ten years.

Review of progress of projects

55. It is understood that the progress of a project entrusted to the Laboratory is reviewed by the Defence Metallurgical Research Laboratory Advisory Committee after a project has been working for three years. A review of important projects is, however, made at every meeting of the Advisory Committee which meets at least once in a year. A report of such reviews is submitted to R & D Organisation.

It appears that the target dates fixed for completion of the projects are not generally adhered to. While the Committee recognise that circumstances can arise in the case of R. & D. Projects, which may call for extension of time and/or for closure of a project, they consider that the targets in such cases should be refixed after proper scrutiny of the progress so far made, and the scientific and technical data and the facilities available at the Laboratory. The purpose of laying the targets is lost when it is not adhered to. For planned development it is essential that targets are realistic and capable of achievement. The Committee recommend that there should be periodical assessment of the progress made particularly for projects which are in progress for more than three years, and wherever necesseary, target dates may be refixed on the basis of the assessment of the progress and of the facilities available or likely to be made available at the Laboratory.

Powder Metallurgy Plant

56. Defence requirements in the field of Powder Metallurgy is considerable. Among items of interest to Defence are Hard metal tools, sintered components for instruments and aircraft, electrical contact materials, filaments for lamps, carbide armour piercing cores, sintered components for guns, iron driving bands for projectiles, sintered magnetic materials of the soft and hard varieties, self-lubricating bearings turbine blades etc. cermets and other high temperature materials for rockets etc. It is stated that limited facilities are available in the country to manufacture a few items like hard metal tools and self lubricating bearings, but in the case of most other items practically no industrial capacity exists. With a view to improve this situation as far as defence requirements are

concerned, the Defence Metallurgical Research Laboratory is in the process of setting up a Powder Metallurgy Research Pilot Plant. For the present it is proposed to confine to the development of tungsten carbide powders and armour piercing projectiles. The Powder Metallurgy Plant has a capacity of making approximately 1,000 AP shots per year. The cost of the plant is Rs. 7,46,800 with a foreign exchange component of Rs. 7,12,800.

Delay in the procurement and installation of the Plant

57. The Committee are informed that the proposal to purchase the powder Metallurgy Plant at the cost of Rs. 5·75 lakhs was first sanctioned in October. 1959. An order for the purchase of the Plant was placed on a foreign firm in October, 1960. Later on, this order was cancelled in October, 1962 as the firm insisted on a revision of the cost of the Plant. A fresh contract was entered into with another foreign firm for the purchase of the Plant at an increased cost of Rs. 7,46,800 with a foreign exchange component of Rs. 7,12,800. The Plant was received by the Laboratory by the middle of 1964. A proposal for a building to house the Plant at Hyderabad was approved in May, 1963 and the construction of the building commenced in July, 1964. The construction of the building including the electrical wiring and mechanical fittings was completed by March, 1965. Rectification of the defects in the building construction and electric wiring is stated to be still in progress.

58. It will thus be seen that there have been considerable delays in the purchase of the Plant as well as in the construction of buildings for locating it. Although the proposal to instal the Plant was sanctioned as early as in October, 1959, it has not yet been installed completely by the D.M.R.L. During evidence the Scientific Adviser has stated that "such cases have no excuse. Generally they should not happen and they do not happen."

The Committee are unhappy at the delay in purchasing and installing the Powder Metallurgy Plant which evidently has resulted in the increased cost of the Plant. It is obvious that the acquisition of such a Plant for a Laboratory which deals with defence metallurgy was a "must" from the beginning. That the Government's approval to the proposal and the actual procurement of the Plant should have taken about five years is really surprising. The Committee would urge that expeditious action should at least now be taken to put in operation the Plant which has been lying idle for more than one and a half years so that the activities of the Laboratory are not further allowed to suffer due to the non-installation of the Plant.

Magnesium Metal Project

59. The project relating to the small scale production of Magnesium metal, which is used in aircraft and armaments, was handled by the Defence Metallurgical Research Laboratory only in the initial stages. The Defence Metallurgical Research Laboratory had only completed experiments on Laboratory scale production of magnesium. The total expenditure incurred by the Defence Metallurgical Research Laboratory on the project was Rs. 8,000.

This was a parallel project which had also been undertaken by the National Metallurgical Laboratory. At a certain stage National Metallurgical Laboratory claimed that they had made considerable progress and that they proposed to put up a pilot plant. The matter was subsequently examined by the Scientific Adviser who finally decided that with a view to avoid duplication, the National Metallurgical Laboratory should be permitted to handle this project and build a pilot plant.

Since magnesium metal is vital for the production of aircraft and armaments, the Committee hope that a close watch will be kept by the Defence Metallurgical Research Laboratory on the progress of the project at the National Metallurgical Laboratory.

Development of Aluminium Alloy Base Plate

60. The project relating to the development of Aluminium Alloy Base Plate was taken up by the Laboratory in 1955. The project envisaged experimental manufacture of base plate out of aluminium alloy preferably by forging, provided facilities were available in the country for this purpose. Several attempts were made by D.M.R.L. to explore the existence of such facilities at important private engineering firms like T.I.S.C.O., T.E.L.C.O., Hindustan Motors, Hindustan Aeronautics Ltd., etc. It was finally realised that adequate facilities for handling this job did not exist in the country.

Since forging facilities capable of handling such a big job were limited in the country, the possibility of forging small parts followed by welding of the parts into a composite plate were initiated by the Laboratory. However, efforts in this direction also failed as raw materials were not readily available through trade sources and only in 1959 they could be procured from the Hindustan Aeronautics Limited, Bangalore. The forging of the blanks was undertaken at Gun Carriage Factory, Jabalpur and completed in April, 1961. As these blanks had to be welded, certain trade firms were persuaded to undertake the job. The preliminary experiments revealed that

the welded joints were unsound. The conclusion drawn was that welding on large scale of these alloys was difficult. The project was ultimately dropped in 1964.

It will be seen that due to non-availability of raw materials and lack of certain Technological facilities either in the Laboratory or elsewhere in the country, the project relating to the development of Aluminium Alloy Base Plate had to be abandoned after nine years and the expenditure incurred on this project was rendered infructuous. The Committee regret to note that this is one of the many instances where a project had to be ultimately dropped due to non-availability of facilities in the country as a whole and Defence Metallurgical Research Laboratory in particular. The Committee would like the Govvernment to examine if any of these dropped projects can be usefully revived and carried to fructification.

Vacuum Induction Furnace

61. A Vacuum Induction Furnace was acquired by the Laboratory towards the end of 1962, primarily for carrying out development work for all high temperature alloys including Nimonic alloys and magnet alloys and secondly to augment the production of magnets. The capacity of the Furnace is 25 Kg. in terms of steel. The cost of the Furnace is Rs. 2.51 lakhs with a foreign exchange component of Rs. 1.95 lakhs.

Programme of work relating to the Furnace

62. As regards the programme of work in relation to the Furnace, it has been stated that three development projects on high temperature nickle base alloys have been sanctioned for Defence Metallurgical Research Laboratory. While one of the three projects was sanctioned in July, 1964, the other two were sanctioned in 1963. These projects may take about 3 years for completion from the time all equipment and necessary raw material requirements become available at the Defence Metallurgical Research Laboratory. Procurement action in this regard is, however, under way.

Delay in the Installation of the Furnace

63. The Committee are informed that although the Vacuum Induction Furnace was received towards the end of 1962, it could only be properly installed at Hyderabad in October, 1964. Further, due to non-availability of power, it could not be put into operation until November, 1965.

The Committee are constrained to observe that this is yet another instance of failure to instal the equipment immediately on receipt.

That it took nearly three years for the Defence Metallurgical Research Laboratory to put the Furnace into operation is really surprising. This is obviously due to bad planning. In this context the Committee cannot over-emphasise that delays in such cases put off production and also result in delay in speedy completion of the various projects which are dependent on the timely installation of the plant and equipment. They recommend that not only energetic effort should be made to ensure that such cases do not recur in future but that action should also be taken to fix responsibility for the default.

Manufacture of Permanent Magnets

64. The Committee are informed that the work relating to the development of permanent magnets was completed by the D.M.R.L. during the years 1956 to 1958 when it was located at Ishapore. The Laboratory had established indigenous production of permanent magnets and met the requirements of various users.

The equipment required for the pilot plant production of magnetic materials was shifted to Hyderabad from Ishapore during May-June, 1964. As the equipment was quite old, considerable repair work was undertaken to bring it to working order. As most of the magnetising and testing equipment, work on D.C. supply, which the Defence Metallurgical Research Laboratory did not have at Hyderabad, procurement action had therefore to be taken to provide each unit with rectifiers and wherever necessary with voltage stabilizers. Magnetising fixtures were also constructed for use with Ignitron Magnetiser. It, therefore, took some time to instal the plant and start the manufacture of magnets. The plant is at present manufacturing magnets to its full capacity since 1965 and the Defence Metallurgical Research Laboratory has supplied permanent magnets for Launcher Rockets.

The Committee are informed that the demand of the various users for the permanent magnets is being met in full by the Laboratory. They trust that since these magnets are very vital for the manufacture of anti-tank firing mechanism, concerted efforts will continue to be made by the Defence Metallurgical Reshearch Laboratory to ensure that there is no shortfall in their production and the demand of the users is met in full as hitherto.

Development of Prototypes

65. The Committee are informed that one of the major difficulties that is encountered towards the development of metallurgy in

defence sector is that proper types of facilities for practical implementation of metallurgical processes are either absent or inadequate in the country. The production organisations like those of the Director General of Ordinance Factories do not have time and sufficient spare capacity to indulge in the experimental and development activities. Similarly the private sector industry is either inadequately equipped or sufficiently over-burdened with the consumer requirements. It is due to this want of sufficient manufacturing potential that many a project in the defence sector has remained unrealised and unexploited.

DMRL Workshop not adequately equipped

66. During evidence the Scientific Adviser has stated that the Defence Metallurgical Research Laboratory Workshop is not adequately equipped at present. According to the present plan of expansion, the Laboratory is expected to be adequately equipped in the course of next three or four years. Further the Laboratory is experiencing considerable difficulties due to lack of foreign exchange because a great deal of equipment which is sophisticated has to be imported.

The Committee need hardly stress that metallurgical research and development is the back-bone of all defence industries. Without a well developed metallurgy, reliable defence of a country is not possible. Considering the inadequacy of facilities for practical implemontation of metallurgical processes in the country, the Committee feel that pilot plant facilities will have to be strengthened at the Defence Metalurgical Research Laboratory. Creation of such facilities will also help in mass production of weapons and equipments at the Ordnance Factories. It will be regrettable if the latest equipment is not made available to the Laboratory for lack of foreign exchange. The Committee, therefore, urge that Government should give serious consideration to this aspect and allocate foreign exchange to the Defence Research and Development Organisation for this purpose. In this context, the Committee also recommend that the facilities that are available at present in the country may be pooled together and a beginning may be made immediately for production of selected metals and alloys on a pilot plant scale. They hope that every effort will be made in the direction.

Development of Barbed Tape

67. As an immediate General Staff requirement of 46,000 reels of barbed tape existed, a project for initial development of 7,000

reels of the tape at an estimated cost of Rs. 1,99,000 had been allotted to Defence Metallurgical Research Laboratory on the 22nd April, 1963. The following stages of indigenous production were envisaged:

(i) Procurement of Steel tape of acceptable hardness and tensile strength:

(ii) Electro-galvanising of the steel tapes; and

(iii) Punching of electro-galvanised tape to the acceptable dimensional limits.

700 spools of barbed tape, punched and electro-galvanised in Defence Metallurgical Research Laboratory, were accepted after user trials.

68. During evidence the Scientific Adviser has stated that the barbed tape has been developed and perfected by DMRL and the D.G.S. & D. is now placing orders for production of large quantities of barbed tape on some private firms. As the process of production of barbed tape did not involve any of the aspects which called for taking a patent, the 'know-how' was passed on to the private firms for mass production of the tape without claiming any royalty from them.

The Committee regret to note that although the development of barbed tape was perfected by the DMRL, no patent has been taken for the item. This has obviously deprived the Government from claiming any royalty thereon from the private firms who have now undertaken the mass production of the tape. The Committee suggest that the matter may be re-reconsidered by Government.

Standardisation of Material Specifications and preparation of Standards

69. One of the functions of the Defence Metallurgical Research Laboratory is the evaluation of the quality of metals and alloys used in various stores. It is stated that in order to achieve self-sufficiency in various metallic materials needed for defence purpose, Defence Metallurgical Research Laboratory has been engaged in the evaluation of the performance of indigenously developed metals, comparing these with those imported and in the establishment of quick and efficient methods for standardisation, with a view to laying down better standards and specifications. Further Defence Metallurgical Research Laboratory is also represented on the various Committees of Indian Standards Institute dealing with specifications and quality control of metals and takes an active part in the formulation of such specifications and standards which are common for civil and defence

needs. A list of Indian Standards Institute Committees on which Defence Metallurgical Research Laboratory is represented is given at Appendix IV.

The Committee feel that standardisation is very essential for achieving self-sufficiency in various metallic materials required for defence purposes and hope that the question of standardisation may be taken up with the Indian Standards Institute at an early date. The Committee also expect that the work of evaluation of the quality of metals and alloys would be expedited.

D. Development of Substitute products

Development of Substitute products and manufacture of critical Stores

70. The Committee understand that the Defence Metallurgical Research Laboratory has not so far developed any substitute products and established manufacture of highly critical stores which require more exacting manufacturing conditions and which are not at present being produced in the country due to lack of technical processing knowledge, know-how, etc. as well as due to non-availability of the required raw materials. This is stated to be due to the fact that the Defence Metallurgical Research Laboratory is at present in the process of build up and is not adequately equipped. During evidence, the Scientific Adviser has stated that plans are being formulated by the Laboratory to undertake the development of substitute products and manufacture of critical stores. As soon as plans are completed, it is hoped to achieve this aim partly.

71. Besides the Emergency Sub-Committee to the Scientific Advisory Committee to the Cabinet has recommended the formation of a Working Group in Metallurgy for reviewing metallurgical problems facing the country. This Sub-Committee consists of the Director, Defence Metallurgical Research Laboratory, the Director, National Metallurgical Laboratory, the Director (Metallurgy) of the Atomic Energy Establishment and the Director National Aeronautical Research Laboratory. It is stated that in its future sittings, the Working Group is likely to consider the requirements of the metallurgical industries as also the question of substitute alloys.

The Committee are aware that development of the indigenous manufacture of raw materials and components now imported from abroad is not an easy task. They, however, would like to stress the urgency of self-sufficiency in such strategic articles and believe that with a determined phased programme much progress could have

been made during all these years. The Committee hope that even now a determined attempt will be made to produce these articles indigenously on a phased programme.

E. Collaboration with National Laboratories/Universities

72. It is stated that the Laboratory since its inception has all along been trying to collaborate effectively with the various National Laboratories especially National Metallurgical Laboratory, Jamshedpur and the Metallurgy Division of the Atomic Energy Establishment, in order to utilise the facilities and equipment wherever applicable for defence metallurgical work. With the declaration of emergency, several problems of defence metallurgical interest have been referred to C.S.I.R. Laboratories. However, as intensive development work is an inevitable pre-requisite for being able to establish indigenous production of imported metals and alloys which are strategic and in short supply, these references have in most cases not yielded quick results. The following items are being tackled in collaboration with C.S.I.R./Universities:—

(a) Production of Magnesium metal;

(b) Development of Sponge Iron required for Production of special and Alloy steel;

(c) Lead Tellurium alloy needed for time delay switches unaffected by temperature variations; and

(d) Miscellaneous *ad hoc* problems like reconditioning of magnesium powder, testing of MU metal etc.

73. During evidence, the Scientific Adviser has stated that effective coordination is being maintained by Defence Metallurgical Research Laboratory with National Metallurgical Laboratory and Metallurgy Division of Atomic Energy Establishment. The three Directors of these Laboratories are represented on the Executive Committees of these Laboratories and as such duplication is avoided and resources are utilised to the best possible advantage. As regards collaboration with the Universities he has stated that some basic problems of metallurgy are being entrusted by the DMRL to the Universities and the Indian Institutes of Technology wherever facilities exist.

The Committee cannot over emphasise the importance of maintaining close collaboration between the Defence Metallurgical Research Laboratory and the National Metallurgical Laboratory, the Indian Institutes of Technology and Atomic Energy Establishment and suggest that energetic steps may be taken to enlarge the scope of this collaboration.

F. Information Cells

Information Cells

74. The Committee are informed that Information Cells have been organised as an integral part of the library services in major Laboratories/Establishments of the Defence R & D Organisation. They are intended for scientific documentation of technical information pertaining to their respective specialised fields. The functional role of these cells is to scan scientific/technical journals, reports etc; and abstract, index, disseminate and store etc; for ready reference on developments in science/technology, so as to help the scientists to know the available literature relating to a proposed project and avoid duplication of R & D. effort. The scope of the activities of these cells also include preparation of bibliographies and translation of scientific and technical literature into English from other foreign languages. The Cells also act as clearing houses for technical enquiries received from Services.

75. It is stated that a Technical information Cell is being organised at the DMRL. The Cell is still in its formative stages and will have a regular documentation service to effectively keep the R & D teams aware of current technical information in the fields of Metallurgy and allied sciences of interest to this Laboratory.

With a view to keep pace with the latest techniques in production and particularly metallurgical requirements of defence, the Committee recommend that early steps should be taken to organise a Technical Information Cell at the Defence Metallurgical Research Laboratory. In this connection they also suggest that the desirability of having a common technical Library for all the three Laboratories located at Hyderabad may also be examined by the Government.

CHAPTER IV

EQUIPMENT AND STORES

A. Purchase of Equipment and Stores

Purchase Procedure

76. A detailed note on the procedure followed for the purchase of stores, machinery and equipment required by the R & D Organisation is placed at Appendix V. In accordance with the present procedure, the Scientific Adviser and Heads of R & D Establishments/Laboratories who are Directors Grade I and Grade II, have powers to sanction local purchase of stores costing upto Rs. 10,000. These powers are in respect of one item or a number of similar items purchased at a time. For items costing more than Rs. 10,000 the indents are raised on Director General, Supplies and Disposals after sanction of the competent financial authority *viz.*, Ministry of Finance (Defence), is obtained.

77. The Committee are informed that the prescribed procedure which is followed by the R & D Organisation as well as all other Government Departments does, however, take time and in several cases cause delay. Further as most of the stores and equipment and servicing facilities required for the research and development work are not easily available in the country, import from abroad had to be resorted to and this involves long delays.

In the Committee's view, the present system of purchase through the Director General of Supplies and Disposals has been causing delay. They feel that the nature of delays as well as their reasons need careful examination by Government at the earliest. In order to expedite the procurement of equipment and stores for various R & D Laboratories/Establishments, the Committee recommend that a Stores Purchase Committee may be set up in the R & D Organisation in consultation with Ministry of Supply and Technical Development with adequate powers to clear indents costing upto Rs. 50,000 per item. They feel that this would go a long way in reducing delays as well as lack of coordination among various authorities concerned.

B. Expenditure incurred on purchase of Stores

Purchase of Stores

78. The following table shows the budget estimates and the actual expenditure incurred by the Defence Metallurgical Research Laboratory during the year 1964-65 on the purchase of stores and equipment:—

(Rs. in lakhs)

Year	Nature of Purchase	Original Estimates	Revised Estimates	Actual Expenditure
1964-65	Central	28·80	11·70	6·71
	Local	8·50	6·00	5·75

It will be seen that there is a wide variation in the original Estimates, Revised Estimates and actual expenditure incurred on the purchase of equipment and stores for the Laboratory during the year 1964-65. The shortfall of about Rs. 5.24 lakhs is stated to be due to the less materialisation of indents placed on the Central Procuring Organisation.

C. Five Year Plan of Budgetary Requirements of DMRL

79. The Committee understand that a Five Year Plan of Budgetary Requirements which is based on the immediate as well as long-term requirements of defence metallurgy and its implementation by the Defence Metallurgical Research Laboratory has been prepared and submitted by the Laboratory for the consideration of Defence R & D Headquarters. The Plan provides a development programme for the Laboratory during the next five years commencing 1964-65. This Plan of expansion *inter alia* envisages additional requirement of machinery and equipment costing about Rs. 3.7 crores. A sizable percentage of this amount will be required in the form of foreign exchange. The cost of equipment and machinery that is

expected to be procured indigenously and from abroad during the years 1964-65 to 1968-69 are given below:—

(Rs. in lakhs)

Year	Indigenous	Imported	Total
1964-65	16·00	13·14	29·14
1965-66	37·76	47·92	85·68
1966-67	25·52	47·61	73·13
1967-68	31·27	66·39	97·66
1968-69	24·90	58·93	83·83
TOTAL . . .	135·45	233·99	369·44

Thus out of a total expenditure of about Rs. 3.7 crores, nearly 2.34 crores *i.e.*, 63.4 per cent will be spent on the import of equipment and machinery required by the Defence Metallurgical Research Laboratory during the next five years, if the Plan is finally approved by the Government.

Indigenous Production of Stores and Equipment

80. The Committee have enquired about the steps taken to augment indigenous production of plant and machinery and other stores. The Scientific Adviser has stated that it all depends upon the equipments required by the R & D Organisation. In the field of electronics there is a great urge in the country to replace older equipments by modern equipments manufactured indigenously. But this will not apply to all fields. Attempts are, however, being made by the Organisation to be self-sufficient in sophisticated machinery within its resources.

81. The Committee understand that enough facilities exist in the country today to provide stores and equipment required for metallurgical research and development work. The National Metallurgical Laboratory, Jamshedpur, Atomic Energy Establishment, Trombay, and Indian Institutes of Technology and at least some of the Universities can very well help in meeting certain types of needs of the Defence Metallurgical Research Laboratory.

The Committee appreciate the attempts which have now been made by the R & D Organisation to augment indigenous production of stores and equipment. They, however, feel, that with a view to reduce dependence on imports and save scarce foreign exchange,

tangible results can be expected. The Committee have observed in the Report that the defence research and development budget will have to increase before the take-off level is reached in some of the important fields like radar, guided missile, synthetic materials and metallurgy. With a view to achieve self-reliance in the field of development of defence science in the country as also to reduce dependence on import of weapons and equipments, the Committee feel that the resources of the R & D Organisation will have to be adequately augmented. They hope that the matter will be duly examined by Government.

NEW DELHI—1;

March 21, 1966.

Phalguna 30, 1887 (*Saka*).

Chairman,

Estimates Committee.

APPENDIX I

(*Vide* para No. 6)

List of Defence Research and Development Establishments/Laboratories

ARMAMENTS GROUP

1. Armaments Research and Development Establishments, Kirkee.
2. Explosives Research and Development Laboratory, Kirkee.
3. Defence Metallurgical Research Laboratory, Hyderabad.
4. Defence Research and Development Laboratory, Hyderabad.
5. Instruments Research and Development Establishment, Dehra Dun.
6. Proof and Experimental Establishment, Balasore.
7. Terminal Ballistics Research Laboratory, Chandigarh.

ELECTRONICS GROUP

8. Electronics and Radar Development Establishment, Bangalore.
9. Defence Electronics Research Laboratory, Hyderabad.
10. Solid State Physics Laboratory, Delhi.

ENGINEERING GROUP

11. Research and Development Establishment (Engineers), (Dighi) near Kirkee.

AERONAUTICS GROUP

12. Aeronautical Development Establishment, Bangalore.
13. Gas Turbine Research Establishment, Bangalore.
14. Aeronautical Test Laboratory, Kanpur.

GENERAL RESEARCH LABORATORIES GROUP

15. Defence Science Laboratory, Delhi.
16. Defence Research Laboratory (Materials), Kanpur.
17. Institute of Nuclear Medicine and Allied Sciences, Delhi.
18. Defence Laboratory, Jodhpur.
19. Defence Food Research Laboratory, Mysore.
20. Naval Chemical and Metallurgical Laboratory, Bombay.
21. Indian Naval Physical Laboratory, Cochin.
22. Defence Institute of Physiology and Allied Sciences, Madras.
23. Fire Service Research Development and Training Establishment, Delhi.
24. Field Laboratory, Leh (including Agricultural Research Farm; Murtise Leh; Agricultural Farm, Ranbirpura, Leh; and Animal Husbandry Farm, Leh).
25. Field Laboratory, Gulmarg.
26. Field Laboratory, Tezpur.
27. Applied Psychological Laboratory and School, New Delhi.

TRAINING INSTITUTES

28. Institute of Armament Technology, Poona.
29. Institute of Work Study, Landour Cantt.

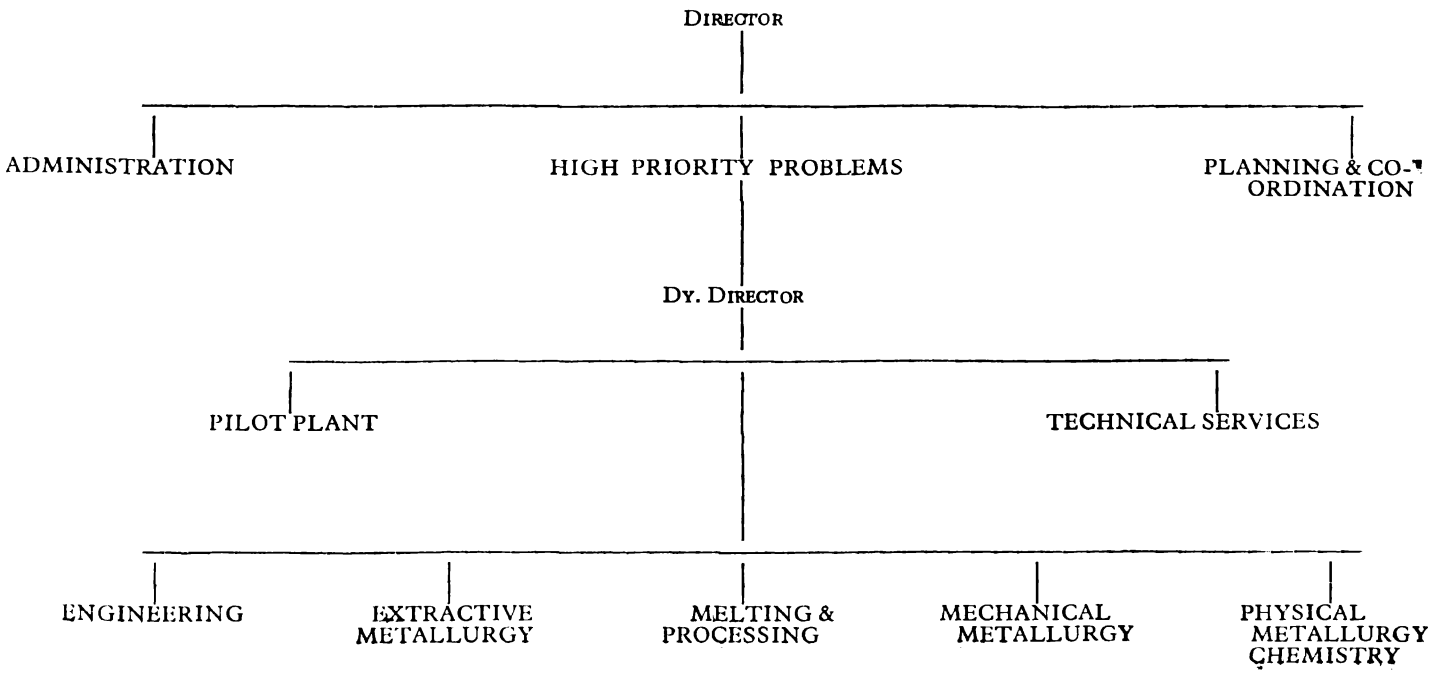
MISCELLANEOUS

30. Scientific Evaluation Group, New Delhi

APPENDIX II

(*Vide* para No. 13)

ORGANISATION CHART



APPENDIX III

(*Vide* para No. 35)

Some of the Financial and Administrative Powers of Laboratories under Atomic Energy Commission, C.S.I.R. and Defence R & D Organisation.

Sl. No.	Nature of Powers	Atomic Energy Establishment, Trombay	Laboratories under C.S.I.R.	Laboratories under Defence R&D Orgn.
1	Powers of reappropriation .	Full.	Upto a limit of 10% of the provision under the unit.	No power.
2	Creation of temporary posts .	(i) Scientific, technical and research for a period not exceeding 5 years on a scale of pay Rs. 950—60—1250 p.m. (ii) Other posts for a period not exceeding 2 years in the scale of Rs. 600—1150.	Scientific technical posts for a period not exceeding one year at the maximum scale not exceeding Rs. 575 p.m.	Class III (non-selection) and Class IV for a period not exceeding 6 months.
	Grant of advance increment (other than on initial appointment) to scientific, technical and research personnel.	Not more than 2 at a time to individuals drawing Rs. 1000/- or more and not more than 3 in the case of the rest.	Upto 3 advance increments on initial appointment concerning a post created under own powers.	No power.
4	Stores and Equipment .	Full.	Upto 50,000/- in each case for working stores, chemicals, equipment, tools and plant.	Upto Rs. 10,000/- per item or no. of similar items purchased at a time.
5	Purchase/contract action .	Upto Rs. 5 lakhs on the basis of open tenders and Rs. one lakh in case of negotiated or single tenders.		Upto the limit of powers for purchase of stores & equipment *viz.*, Rs. 10,000/- (Responsibility of the M.E.S.)
6	Maintenance and repairs. .	Full.	Full in respect of ordinary repairs and upto Rs. 50,000 for original petty works and special repairs.	

APPENDIX IV

(*Vide* para No. 69)

ISI COMMITTEES ON WHICH D.M.R.L. IS REPRESENTED

1. Structual and Metal Division Council (SHDC)
2. Metal Stores Section Committee, SMDC 1
3. Methods of Chemical Analysis Committee, SMDC 2
4. Methods of Physical Test Sectional Committee, SMDC 3
5. Steel Sectional Committee, DMDC 5
6. Light Metals and their Alloys Section Committee, SMDC 10
7. Copper and Copper Alloys Sectional Committee, SMDS 11
8. Lead, Zinc, Antimony and their Alloys Sectional Committee, SMDC 12
9. Alloys Steel and Special Steel Sectional Committee, SMDC 19
10. Steel Tubes, Pipes and Fittings Sectional Committee, SMDC 22
11. Metallic Finishes Sectional Committee, SMDC 23.

APPENDIX V

(*Vide* para No. 76)

Introduction

The purchase of stores and equipment for the R. & D. Organisation can be divided into three parts as follows:—

(a) Items costing less than Rs. 10,000 involving no foreign exchange.

(b) Items costing less than Rs. 10,000 involving foreign exchange.

(c) Items costing over Rs. 10,000.

Procedure for the Procurement of Equipment

Items costing less than Rs. 10,000 involving no foreign exchange

The Scientific Adviser and Heads of R. & D. Establishments/ Laboratories who are Directors Grade I and Grade II have powers to sanction local purchase of stores costing upto Rs. 10,000. These powers are in respect of one item or a number of similar items purchased at a time. In such cases Heads of Establishments (Directors Grade I and II) call for quotations and sanction the purchase under their own financial powers and no reference in respect of these purchases is made in Headquarters R & D. Organisation.

Heads of Establishments below the rank of Director Grade I and Grade II have powers to sanction local purchase upto Rs. 5,000. Any item or a number of similar items costing upto Rs. 5,000 are sanctioned by these heads of Establishments under their own powers. The purchase of items costing over Rs. 5,000 upto Rs. 10,000 is referred to the respective Technical Directors at this HQ who, if they approve of the purchase, accord sanction for the purchase under the powers of the Scientific Adviser which have been delegated to the Technical Directors.

In all the above purchases the normal rules of purchase *e.g.*, calling for quotations, etc., are followed.

Items costing less than Rs. 10,000 involving foreign exchange

All proposals for the procurement of stores costing less than Rs. 10,000 involving release of foreign exchange are submitted to this HQ. These proposals are vetted by the Technical Directors who personally accept the necessity for the procurement of the items. After acceptance of necessity by the Technical Directors, the proposals are submitted to the Chief Controller Research and Development for approval of the release of foreign exchange involved in the procurement. After CC R & D. has accorded his approval, the cases are referred to the Ministry of Finance (Defence) for examination from an expenditure angle and release of foreign exchange. On receipt of release of foreign exchange from the Ministry of Finance (Defence), the following action is taken.

(a) If the foreign manufacturer whose item is being procured is represented by an Indian Agent, the R. & D. Establishment is notified of the release of foreign exchange and asked to place an order on the Indian Agent who is then provided with an Import Licence for importing the store.

(b) If the foreign manufacturer is not represented by any Indian Agent, an indent for the procurement of the item is placed directly by this HQ on the procuring agency *e.g.*, D.G.I.S.M., London/D.G.I.S.M., Washington.

Items costing over Rs. 10,000

All proposals for the procurement of equipment and stores costing over Rs. 10,000 are submitted by R. & D. Establishments/Laboratories to HQ R. & D. Organisation. These proposals are vetted by the Technical Directors, who accept necessity for procurement of the items. After acceptance of necessity by the Technical Directors and if no foreign exchange is involved, the proposals are referred to the Ministries of Defence and Finance (Defence) for concurrence.

If, however, foreign exchange is involved, the proposals are also referred to CC R. & D./Dy. CS for their approval to the procurement of the equipment. Proposals involving release of more than Rs. 50,000 in foreign exchange are also seen personally by the Scientific Adviser. After approval by SA/CC R&D/Dy. CS., as the case may be, the proposals are referred to the Ministries of Defence and Finance (Defence) for the concurrence and release of foreign exchange.

On receipt of concurrence of the Ministries of Defence and Finance (Defence) and release of the required foreign exchange, the following action is taken—

(a) For all items costing over Rs. 25,000 whether or not involving foreign exchange indents are raised on DG.S.&D. New Delhi.

(b) For items costing more than Rs. 10,000 and less than Rs. 25,000 if no foreign exchange is involved, the indents are raised on D.G.S.&D., New Delhi. If foreign exchange is involved and the manufacturer is represented by an Indian Agent, the ident is raised on the D.G.S.&D., New Delhi. If the manufacturer is not represented by an Indian Agent, the indent is raised on the procuring agency abroad *e.g. D.G.I.S.M.* London/D.G.I.S.M. Washington|Indembassy Japan.

APPENDIX VI

Statement showing the summary of recommendations/conclusions contained in the Report..

Sl. No.	Reference to para No. of the Report	Summary of recommendations/conclusions
1	2	3
5	10	The Committee would like it to be noted that while the expenditure on research and development relating to defence, expressed in terms of the total defence expenditure in U.S.A., U.K. and U.S.S.R. is 15 per cent., the corresponding figure for India is only 1 per cent. They feel that to make defence research really effective and useful, the budget allotment for research should be augmented to the extent required for reaching the take-off level.
	16	The Committee are not fully convinced with the reasons advanced for shifting the Laboratory from Ishapore to Hyderabad. They realise that the accommodation then available at Ishapore was inadequate particularly for the needed expansion and development of the Laboratory. Yet the Committee feel that before deciding the change hastily and before shifting the equipments from Ishapore, the Government should have considered among other things (i) the locational advantage likely to be achieved from the proximity of metal and metallurgical industries, (ii) the dislocation to be caused in the research and development work undertaken in the Laboratory, (iii) benefits rendered to and to be derived from Ordnance Factories near Ishapore, (iv) the availability of proper accommodation at Hyderabad for putting the equipment and machinery to use and to avoid keeping these idle for a pretty long time, and (v) provision of power water, residential quarters etc. The Committee consider that in locating the Defence Metallurgical Research Laboratory at Hyderabad the Government should have ensured the prompt provision of the pre-requisites of the Laboratory *e.g.*, proper accommodation, power,

1	2	3
		water etc. This deserved special consideration because of the shifting taking place after the Chinese aggression which made it imperative to avoid any suspension of and dislocation in the work of defence research. At any rate, if the Defence Metallurgical Research Laboratory had been allowed to remain at Ishapore, the dislocation of work during the emergency consequent upon the shifting of the laboratory would have been avoided during the emergency. The Committee, however, recommend that in future Government should give careful thought and consideration to all aspects and also lay down definite criteria before finally deciding upon the location of the Defence R. & D. Laboratories/ Establishments.
3	21	The Committee consider it unfortunate that the Government had not given due consideration to these important matters at the time when the decision was taken to retain a Defence Metallurgical Research Laboratory Cell at Ishapore. They feel that if the Cell is expected to fulfill the tasks assigned to it, the question of providing the necessary equipment and facilities as also the authority and status may be examined by Government at a very early date. The Committee hope that Government would examine the whole matter without further delay as assured by the Scientific Adviser so that the Cell at Ishapore is of real help to the users.
4	23	The Committee are not satisfied with the present arrangement which leads to a great deal of administrative delay, difficulties in the discharge of the allotted work and consequent inconvenience to the staff. The Committee understand that unless all accounting documents are countersigned by the Director, DMRL, Hyderabad, they do not have any validity in the eyes of C.D.A. (Southern Command), Poona. The Committee have been surprised to learn that the accounts of the Cell, which is so near to Calcutta, have to be audited by the C.D.A. (Southern Command), Poona and not by the C.D.A. (Factory), Calcutta. They recommend that all these matters may be examined by the authorities concerned at an early date and suitable steps taken to eliminate unnecessary hardship to the staff, difficulties to the administrative authorities and handicaps to the smooth working of the Cell.

1	2	3
5	25	The Committee consider that it will be advantageous to secure the advice and experience of the best talents available in the country for the D.M.R.L. Advisory Committee in the interest of the Laboratory as a whole. They, therefore, suggest that the desirability of having a specialist from the private sector industry on the Defence Matallurgical Research Laboratory Advisory Committee may be considered by the Government as such a representation will ensure an independent and critical approach to a problem, which can as well act a a stimulant to the work of the Laboratory.
6	26	The Committee do not feel happy about the position stated in this para. They consider that if the Defence Metallurgical Research Laboratory Advisory Committee is to fulfill its objectives with which it has been set up, the Advisory Committee should meet more frequently in future. The Committee feel that the rule regarding the frequency of the meeting of any Advisory Committee should indicate the minimum number of meetings in a year rather than put a ceiling on the number as has been done in the present case—"not more than twice a year". The Committee hope that the matter will be examined by Government at an early date.
7	29	In view of the fact that the functions and activities of the various Research and Development Laboratories/Establishments have increased considerably, the Committee are of the view that the appointment of a Governing Council as envisaged in the Model Constitution for each major R. & D. Laboratory/Establishment would be a step in the right direction. The Committee feel that this arrangement will help the Laboratory in selecting the research projects and in promoting expeditious completion of research projects assigned to them and in administrative work so that the Director and other research workers will find more time to devote to techni- and scientific work. The Committee hope that an early decision will be taken in the matter.
	32	The Committee partly agree that the shortage of properly equipped technical and scientific reseach personnel in the Defence R. & D. Laboratories/Establishments is due to the general short-

1	2	3
		age of technical and scientific staff in the country. In this connection, they would like to refer to the information given by an eminent Metallurgist that the country is not short of technical and scientific staff but what is lacking is the machinery which can locate and recognize talents and take good care of them and enthuse them with confidence for nation-building tasks. The Committee feel that the scientists in the country do not have proper encouragement and facilities to pursue advanced studies. Besides, they have to work under great handicap on account of bureaucratic rules and procedures. Because of this, some of the best brains of the country go abroad and in many cases settle there out of a sense of frustration and the Committee think that this drain of the scientific talents of the nation should be checked at an early date. In the Committee's view at least a partial remedy lies in the improvement of conditions of work including the facilities in the Research Laboratories and salaries. The Committee recommend that concerted efforts should be made by Government to locate scientific and technical talents in the country by offering them all possible facilities and better career prospects. They further recommended that as a long-term measure to remove the shortage in the supply of properly trained scientists and technologists, the Defence R & D Organisation, the Council of Scientific and Industrial Research and the Education Ministry should make an assessment of the nation's requirements of scientists and technologists for each Plan period and to make the necessary arrangement for their training within the country and if necessary also abroad.
	33	In this connection the Committee would like to observe that while the Defence Metallurgical Research Laboratory Cell has some experienced technical officers on its strength who do not have full-time work, the Headquarters Defence Metallurgical Research Laboratory at Hyderabad has a number of young scientists with little experience. The Committee suggest the desirability of providing adequate training for these young scientists so that they can undertake serious research in as short a time as possible.
	34	It is evident that no systematic norms of work lad have so far been laid down for any categories

1	2	3
		of the staff. The Committee consider that fixing of such norms is very essential for efficient and economical utilisation of staff. They recommend that steps should be taken by the Defence R. & D. Organisation to determine, as far as possible, the norms of work for all categories of staff particularly for the non-technical staff and to reassess and rationalise the staff strength of all R & D Laboratories/Establishments accordingly.
11	37	With a view to avoid delays and also in the interest of the smooth and efficient functioning of the Laboratories, the Committee recommend that the desirability of raising the powers of the Directors Grade I of the Defence R & D Laboratories/Establishments to bring them at par with those of their counterparts in C.S.I.R. may be examined by Government.
12	38	The Committee cannot over-emphasise the importance of well-designed training schemes for a Laboratory which is engaged in the research and development of defence metallurgy. They suggest that closer coordination should be maintained with the training schemes of National Metallurgical Laboratory, Atomic Energy Establishment and other private and public sector undertakings, with a view to take full advantage of their experience in the same field. The Committee also recommend that as far as possible, some of the scientists and technologists of the Laboratory should also be sent to Ordnance or other allied factories in the country for short periods in order to familiarise themselves with the manufacturing problems.
13	39	The Committee are surprised to note that residential accommodation has not so far been provided to any member of the staff of the Defence Laboratories at Hyderabad although these are located at a distance of 7-8 miles from the city and the intervening area is not also inhabited. During their visit to Hyderabad in October, 1965, the Defence Sub-Committee of the Estimates Committee noticed that there were no proper transport arrangements for the conveyance of the staff from and to the city. The Committee realise that due to financial stringency at present, it may not be

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		possible and advisable to undertake a programme of constructing residential quarters. Nevertheless they consider that for efficiency of work steps should be taken by the Organisation to arrange a proper bus service preferably with the help of the State Government or with the local transport authorities so that the staff working in the three laboratories, namely, Defence Metallurgical Research Laboratory, Defence Research and Development Laboratory and Defence Electronics Research Laboratory is not put to any inconvenience. The Committee hope that an early action will be taken in the matter.
14	41	The Committee find that although the decision to shift the Laboratory from Ishapore to Hyderabad was taken as early as in February, 1963, not much advance planning had been done in the matter of provision of permanent accommodation for this Laboratory. They feel unhappy that sufficient vigour has not been shown in dealing with this problem. The Committee recommend that every effort should at least now be made to complete the buildings for the Laboratory as early as possible as the delays in such cases invariably increase the estimated cost of the projects and adversely affect the output of research work of the Laboratory.
15	43	The Committee are not convinced by the reasons advanced for the shortfall in expenditure. They are concerned over such shortfalls. The Committee feel that such shortfalls at the end of the year do not reflect well, as such shortfalls in expenditure will mean shortfall in development and research work also. They trust that the Laboratory would be more careful in future in preparing its budget estimates in a realistic way. Having budgeted for a certain amount, the Laboratory should ensure that the funds are fully utilised in a planned and economic way.
16	45	The Committee appreciate the difficulties encountered by the Defence R & D Organisation regarding the release of foreign exchange. They feel that the present procedure for allocation and sanction of foreign exchange for procurement of equipment and stores etc. by the Defence R & D Establishments/Laboratories is cumbersome and

1	2	3
		time consuming and needs to be simplified. The Committee recommend that the matter may be examined by Government at an early date.
17	46	The Committee note that the question of introducing cost accounting in some form is already engaging the attention of the R & D Organisation. They recommend that steps should be taken to make cost accounting a reality so as to enable the R & D Organisation to exercise effective control over the operational expenses of the Laboratories/Establishments.
18	55	It appears that the target dates fixed for completion of the projects are not generally adhered to. While the Committee recognise that circumstances can arise in the case of R. & D. Projects, which may call for extension of time and/or for closure of a project, they consider that the targets in such cases should be refixed after proper scrutiny of the progress so far made, and the scientific and technical data and the facilities available at the Laboratory. The purpose of laying the targets is lost when it is not adhered to. For planned development it is essential that targets are realistic and capable of achievement. The Committee recommend that there should be periodical assessment of the progress made particularly for projects which are in progress for more than three years, and wherever necessary, target dates may be refixed on the basis of the assessment of the progress and of the facilities available or likely to be made available at the Laboratory.
19	58	The Committee are unhappy at the delay in purchasing and installing the Powder Metallurgy Plant which evidently has resulted in the increased cost of the Plant. It is obvious that the acquisition of such a Plant for a Laboratory which deals with defence metallurgy was a "must" from the beginning. That the Government's approval to the proposal and the actual procurement of the Plant should have taken about five years is really surprising. The Committee would urge that expeditious action should at least now be taken to put in operation the Plant which has been lying idle for more than

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		one and a half years so that the activities of the Laboratory are not further allowed to suffer due to the non-installation of the Plant.
20	59	Since magnesium metal is vital for the production of aircraft and armaments, the Committee hope that a close watch will be kept by the Defence Metallurgical Research Laboratory on the progress of the project at the National Metallurgical Laboratory.
21	60	It will be seen that due to non-availability of raw materials and lack of certain technological facilities either in the Laboratory or elsewhere in the country, the project relating to the development of Aluminium Alloy Base Plate had to be abandoned after nine years and the expenditure incurred on this project was rendered infructuous. The Committee regret to note that this is one of the many instances where a project had to be ultimately dropped due to non-availability of facilities in the country as a whole and Defence Metallurgical Research Laboratory, in particular. The Committee would like the Government to examine if any of these dropped projects can be usefully revived and carried to fructification.
22	63	The Committee are constrained to observe that this is yet another instance of failure to instal the equipment immediately on receipt. That it took nearly three years for the Defence Metallurgical Research Laboratory to put the Vacuum Induction Furnace into operation is really surprising. This is obviously due to bad planning. In this context, the Committee cannot over-emphasise that delays in such cases put off production and also result in delay in speedy completion of the various projects which are dependent on the timely installation of the plant and equipment. They recommend that not only energetic efforts should be made to ensure that such cases do not recur in future but that action should also be taken to fix responsibility for the default.
23	64	The Committee are informed that the demand of the various users for the permanent magnets is being met in full by the Laboratory. They trust that since these magnets are very vital for the manufacture of anti-tank firing mechanism, concerted efforts will continue to be made by

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		the Defence Metallurgical Research Laboratory to ensure that there is no shortfall in their production and the demand of the users is met in developed metallurgy, reliable
24	66	The Committee need hardly stress that metallurgical research and development is the backbone of all defence industries. Without a well-developed metallurgy, reliable defence of a country is not possible. Considering the inadequacy of facilities for practical implementation of metallurgical processes in the country, the Committee feel that pilot plant facilities will have to be strengthened at the Defence Metallurgical Research Laboratory. Creation of such facilities will also help in mass production of weapons and equipments at the Ordnance Factories. It wil be regrettable if the latest equipment is not made available to the Laboratory for lack of foreign exchange. The Committee, therefore, urge that Government should give serious consideration to this aspect and allocate foreign exchange to the Defence Research and Development Organisation for this purpose. In this context, the Committee also recommend that the facilities that are available at present in the country may be pooled together and a beginning may be made immediately for production of selected metals and alloys on a pilot plant scale. They hope that every effort will be made in the direction.
25	68	The Committee regret to note that although the development of barbed tape was perfected by the Defence Metallurgical Research Laboratory, no patent has been taken for the item. This has obviously deprived the Government from claiming any royalty thereon from the private firms who have now undertaken the mass production of the tape. The Committee suggest that the matter may be reconsidered by Government.
26	69	The Committee feel that standardisation is very essential for achieving self-sufficiency in various metallic materials required for defence purposes and hope that the question of standardisation may be taken up with the Indian Standards Institute at an early date. The Committee also expect that the work of evaluation

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		of the quality of metals and alloys would be expedited.
27	71	The Committee are aware that development of the indigenous manufacture of raw materials and components now imported from abroad is not an easy task. They, however, would like to stress the urgency of self-sufficiency in such strategic articles and believe that with a determined phased programme much progress could have been made during all these years. The Committee hope that even now a determined attempt will be made to produce these articles indigenously on a phased programme.
28	73	The Committee cannot over emphasise the importance of maintaining close collaboration between the Defence Metallurgical Research Laboratory and the National Metallurgical Laboratory, the Indian Institutes of Technology and Atomic Energy Establishment and suggest that energetic steps may be taken to enlarge the scope of this collaboration.
29	75	With a view to keep pace with the latest techniques in production and particularly metallurgical requirements of defence, the Committee recommend that early steps should be taken to organise a Technical Information Cell at the Defence Metallurgical Research Laboratory. In this connection they also suggest that the desirability of having a common technical Library for all the three Laboratories located at Hyderabad may also be examined by the Government.
30	77	In the Committee's view, the present system of purchase through the Director General of Supplies and Disposals has been causing delay. They feel that the nature of delays as well as their reasons need careful examination by Government at the earliest. In order to expedite the procurement of equipment and stores for various R & D Laboratories/Establishments the Committee recommend that a Stores Purchase Committee may be set up in the R & D Organisation in consultation with Ministry of Supply and Technical Development with adequate powers to clear indents costing upto Rs. 50,000 per item. They feel that this would go a long way in reducing delays as well as lack of coordination among various authorities concerned.

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31	81	The Committee appreciate the attempts which have now been made by the R & D Organisation to augment indigenous production of stores and equipment. They, however, feel, that with a view to reduce dependence on imports and save scarce foreign exchange, greater effort is needed to establish expeditiously indigenous production of stores and equipment particularly required by the Defence Metallurgical Research Laboratory. The Committee suggest that Government may conduct a survey of the existing capacity for manufacture of the metallurgical equipment in the country so that machinery, equipment and spare parts which can be indigenously produced, may not be imported.

APPENDIX VII

Analysis of recommendations/conclusions in the Report

I. CLASSIFICATION OF RECOMMENDATIONS:

A. Recommendations for improving the organisation and working:

Serial Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 18, 28, 29 and 30.

B. Recommendations for effecting economy:

Serial Nos. 10, 15 and 17.

C. Miscellaneous Recommendations:—

Serial Nos. 13, 14, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27 and 31.

II. ANALYSIS OF MORE IMPORTANT RECOMMENDATIONS DIRECTED TOWARDS ECONOMY:

Sl. No.	Sl. No. as per Summary of Recommendations	Particulars
1	10	The Committee recommend that steps should be taken to determine, as far as possible, the norms of work for all categories of staff.
2	15	The Committee trust that the Laboratory would be more careful in future in preparing its budget estimates in a realistic way. Having budgeted for a certain amount, the Laboratory should ensure that the funds are utilised in a planned and economic way.
3	17	The Committee recommend that steps should be taken to make cost accounting a reality so as to enable the R & D Organisation to exercise effective control over the operational expenses of the Laboratories/Establishments.

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