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NRL Report 4300

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REVIEW OF THE SCIENTIFIC PROGRAM AND ORGANIZATION OF THE NAVAL RESEARCH LABORATORY

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January 1954

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Washington, D.C.

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18 January 1954

From: Scientific Program and Organization Committee
To: Director, Naval Research Laboratory

Subj: Report of Scientific Program and Organization Committee

Ref: (a) NRL Inst. 3927.1 of 17 June 1953
(b) Memo 1101-143/53ect of 10 August 1953

Encl: (1) Review of the Scientific Program and Organization of the Naval Research Laboratory, NRL Report 4300

1. The report of the Scientific Program and Organization Committee is submitted as enclosure (1). It contains summaries of the Committee's interviews both within and outside of the Laboratory and makes recommendations relative to the scientific program, the Research Department organization, procedures, and committees. The Committee unanimously supports the recommendations.

2. One of the recommendations is that the Associates to the Director of Research should be placed in line. In view of the position of the Committee members with respect to this recommendation and of the fact that the recommended positions are different from the current ones, the Committee members hereby submit their resignations as Associates to the Director of Research so that the Director and Director of Research will have complete freedom to select the best qualified individuals for the new positions.

Oscar T. Marzke

Oscar T. Marzke, Chairman

Ernst H. Krause

Ernst H. Krause

Robert M. Page

Robert M. Page

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NRLINST 3927.1
17 June 1953

NAVAL RESEARCH LABORATORY
Washington 25, D. C.

NRL INSTRUCTION 3927.1

From: Director
To: Distribution Lists A and B

Subj: Establishment of Scientific Program and Organization Committee

1. Purpose. This Instruction establishes a Scientific Program and Organization Committee and appoints its members.

2. Establishment of Committee. An ad hoc committee of the Administrative Advisory Committee, to be known as the Scientific Program and Organization Committee, is hereby appointed. The Committee is to consist of the three Associates to the Director of Research, Doctors Krause, Marzke, and Page, with Dr. Marzke serving as Chairman.

3. Functions of the Committee.

The mission of the Committee is to:

a. Make a thorough survey of all current and proposed scientific and technical programs at the Laboratory and the organizational disposition of the work on these programs;

b. Discuss with representatives of CNO, ONR, the Bureaus, the AEC and other agencies, as required, their present and future research needs;

c. Survey, in so far as possible, the methods employed by other laboratories for determining, maintaining, and adjusting their scientific programs and organization;

d. On the basis of subparagraphs a, b, and c, and in the light of the over-all NRL mission, critically evaluate the existing and proposed scientific program and the existing scientific organization for carrying out this program. This should be done with a view to determining which programs or

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parts of programs should be continued, dropped or changed and what organizational changes, if any, should be effected to best carry out such programs. Consideration should be given also to the initiation of new programs heretofore not proposed. This evaluation should be based on the assumptions that the budgetary support will, using the FY 1954 budget as established on 1 July 1953 as a reference level, (1) continue at the reference level, (2) be reduced 25%, (3) be increased 25%. Further, for purposes of this study, it should be assumed that the money available will be used in an optimum manner as between personal services and other expenditures.

e. Prepare a report to be submitted to the Administrative Advisory Committee embodying recommendations resulting from the considerations of subparagraph d. The report should be submitted not later than 1 October 1953.

4. Assistance Required. All personnel of the Research Department are directed to meet and work with the Committee as required and to make such presentations before the Committee as it may request. The Director's Office, the Administrative Department and the Office of the Comptroller are hereby directed to furnish the Scientific Program and Organization Committee whatever assistance, data or information they may request.

W. H. BELTZ

J. B. MAHER
By direction

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1101-143/53ect

10 August 1953

MEMORANDUM

From: 1101
To: 3000 (Dr. Marzke, Acting)

Subj: Visits to Administrative Divisions by Scientific Program and Organization Committee

1. It is requested that the members of the Committee, which has under consideration matters affecting the research program, make a visit to each of the administrative divisions.

2. Such visits would serve to acquaint the Committee members with the staffing and functioning of the service divisions, as they are constituted at the present time. I think these visits would be most beneficial to the Laboratory as a whole, particularly since the Associates to the Director of Research are concerned with and are the policy makers not only for the research divisions, but, as members of the Administrative Advisory Committee, for the administrative groups as well.

J. B. MAHER

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CHAPTER 1

INTRODUCTION

1.1 HISTORICAL REVIEW

The Naval Research Laboratory is one of the largest research laboratories in the country. Its investigations cover a broad range of scientific subjects and the character of its work runs the gamut from basic research to test and evaluation.

The Naval Research Laboratory was created in 1916, as the result of a recommendation of a Naval Consulting Board headed by Thomas A. Edison, with the mission "To increase the safety, reliability and efficiency of the Fleet by the application of scientific research and laboratory experimentation to Naval problems"[1]. The Laboratory became a physical reality in 1923. It was originally set up under the Office of the Secretary of the Navy and in succeeding years it was administered by various Navy offices and Bureaus[2]. In 1946 it was made part of the newly created Office of Research and Inventions, now the Office of Naval Research. This Office was commissioned "to encourage, promote, plan, initiate and coordinate naval research and to conduct naval research in augmentation of, and in conjunction with, research and development conducted by the respective bureaus and other agencies and offices in the Department of the Navy"[3].

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As the principal operating laboratory of the Office of Naval Research, the Naval Research Laboratory is assigned the mission "to support the Chief of Naval Research in his effort to preserve national security by initiating, planning and conducting in the physical sciences, applied research and development to meet the immediate needs for equipment and materials to increase the combat effectiveness of the Navy, and fundamental research and experimentation in anticipation of future requirements".[4]

Following World War II, the Laboratory, in keeping with the generally recognized importance of adding to the store of fundamental scientific knowledge, placed greater emphasis on research of a more fundamental character. This shift of emphasis, which was most pronounced in the first two years after the War, was somewhat modified in the early 1950's in order to meet the more immediate needs created by the Korean War. With the Armistice in Korea came a slackening of those needs.

The growth of the Laboratory over these years can be seen from the increase in the total annual fiscal obligations, shown in Table 1.1. The rapidity and magnitude of growth over the past several decades, together with the recession of 1949 and of the last two years, graphically identify the current management problem. This problem of growth and adjustment is common to many other laboratories and research agencies.[5-9]

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1.2 FINANCIAL SUPPORT

The Laboratory is supported in part by Research Navy Funds from the Office of Naval Research, and in part by funds from other sources. For FY 1954 the total operating budget is about 26 million dollars. Of this about one-third is for maintenance and operation, and this is supplied by the Office of Naval Research. Another one-third is supplied by the Office of Naval Research for research direct cost; this is not specifically allocated to projects, but supports the research program generated by the Laboratory. The remaining one-third is supplied by other agencies, principally the Naval Materiel Bureaus, the Army, the Air Force and the Atomic Energy Commission. These funds carry with them obligations to perform certain tasks of interest to the suppliers of the funds, and constitute payment of direct costs in support of these tasks.

The maintenance of financial support at a level adequate for effective operation of the Laboratory is a matter of perennial administrative concern. In times of military expansion, no real problem exists. With reduction of Department of Defense budgets, however, money for support of the Laboratory may be more difficult to find, and financial support may become a major administrative problem.

Starting in July 1954 the Laboratory will begin operating under the Navy Industrial Fund system of financial accounting.[10]

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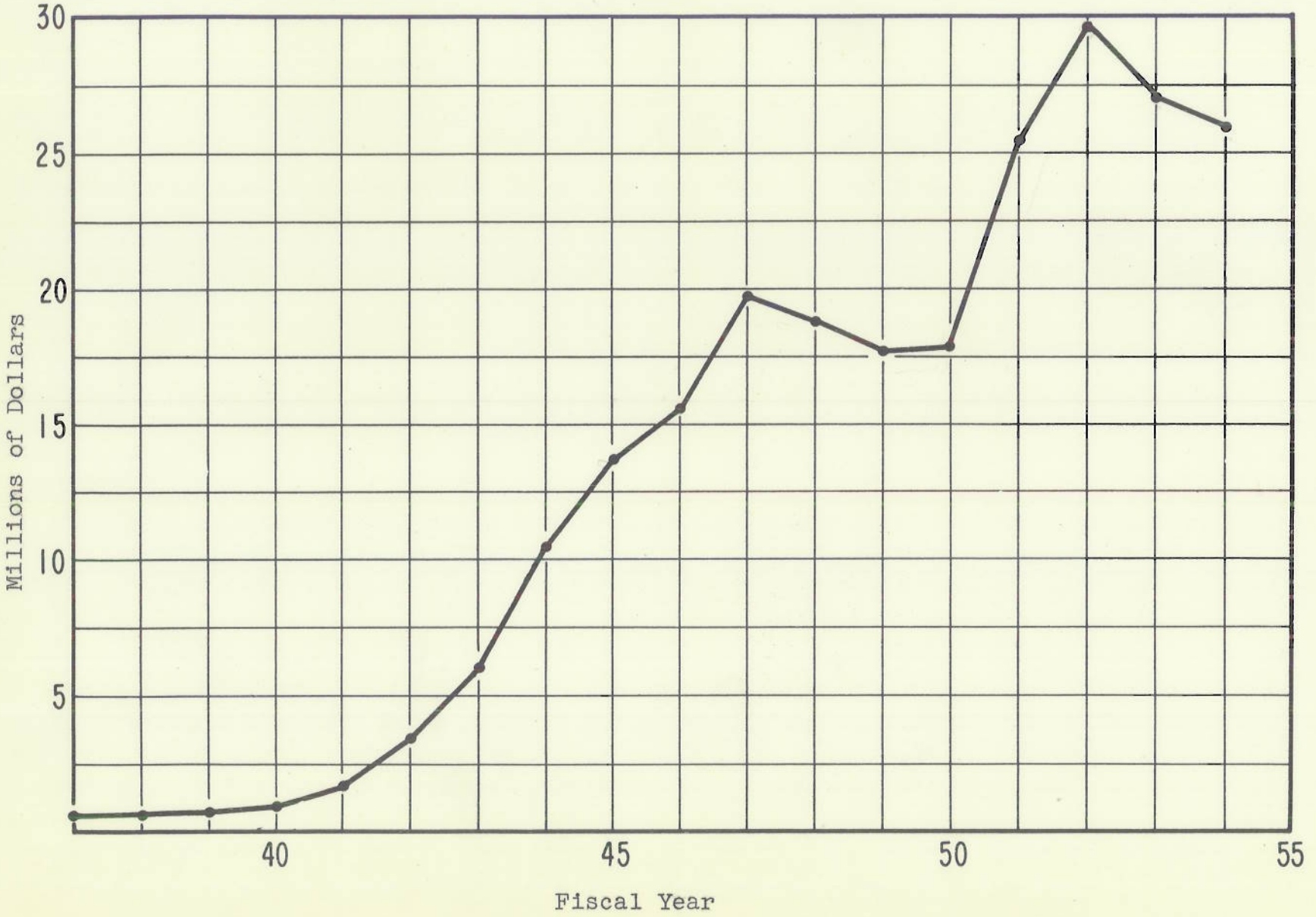
Under this system, the overhead costs of the maintenance and operation of the Laboratory are to be charged against individual projects. As a result, the Laboratory may well find itself in more severe competition with other laboratories rendering services of a similar nature.

The combined effects of reduced Department of Defense budgets and of overhead charges to research projects need not be calamitous to the Laboratory, but they do necessitate continuous close scrutiny of overhead costs and increased attention to the value produced for each direct cost dollar spent. Re-evaluation of Laboratory management is necessary, to the end that prudence may be generated by cost consciousness without stifling enthusiasm generated by scientific inspiration. The Laboratory has been the subject of previous surveys, but these were made either in a period of expansion or were concerned with administrative matters.[11-15]

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TABLE 1.1



OBLIGATIONS INCURRED BY THE NAVAL RESEARCH LABORATORY

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CHAPTER 2

BACKGROUND INFORMATION

2.1 INTRODUCTION

The present program and organization of the Naval Research Laboratory are the result of thirty years of growth and planning. Because of its large size, the Laboratory's program and organization are complex. A thorough understanding of the present program and organization must be the starting point for any future planning. A survey and review of the internal Laboratory activities were made and in addition the Committee members drew on their experience in responsible positions as Laboratory staff members.

Future programming also necessitates a knowledge of future requirements. Every effort was made to obtain opinions from responsible individuals in the Laboratory, the Navy Department and other places, to assist the Committee in ascertaining the Navy's requirements for the future and setting up a research program to meet those requirements.

Finally, the Committee endeavored to obtain from other research laboratories and their management, both industrial and military, advice on the difficult problem of how to direct research without at the same time stifling it.

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A wealth of information was obtained from these interviews which, by virtue of sheer bulk, can only be summarized briefly here.

2.2 VISITS TO NAVY BUREAUS AND OFFICES

All Navy bureaus and offices having broad technical responsibilities for research and development programs were visited. These visits are listed in Table 2.1. Discussions concerned the scientific standing of the Naval Research Laboratory, its technical program in terms of Navy needs - present and anticipated - and its relationship to other Navy laboratories.

The Naval Research Laboratory stands in very high regard in the Navy. Each office identified urgent needs within its own cognizance to which it was hoped the Naval Research Laboratory might contribute. The areas most frequently mentioned as requiring additional effort were those of nuclear power, low frequency sonar, systems work and reliability of electronics equipment.

In regard to the relationship between the Naval Research Laboratory and Bureau laboratories, three points were brought out; namely, that the Naval Research Laboratory should 1) support the relatively short term projects of the Bureau laboratories with research of a more basic nature, 2) fill gaps

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in the overall research program of the Bureau laboratories, and 3) augment the programs of the Bureau laboratories where its unique facilities or geographical location are significant factors.

2.3 VISITS TO COMMERCIAL LABORATORIES

The commercial laboratories visited were selected either because they were comparable to the Naval Research Laboratory in at least one important respect or because their Directors were members of the Naval Research Advisory Committee. Table 2.2 lists these visits.

The discussions at commercial research laboratories concerned principally organization, management and research costs. General comments concerning the Naval Research Laboratory were also obtained.

All of the laboratories are organized on a conventional pyramidal pattern with line positions occupied by men with scientific training and experience. Each of the larger laboratories has a Director of Research with Associate Directors in line, each Associate over a group of operating units.

Usually such service functions as shops, publications, personnel, etc., are under a top executive who is a scientist and whose responsibilities include the laboratory's research functions. Where they do not come under the Director of

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Research, men with scientific experience are frequently put in charge of the service divisions, preferably by transfer from the Scientific Department.

The importance of setting up administrative procedures in such a way that supervising scientists do not become dominated by the non-scientific aspects of administration is widely recognized. This is generally accomplished without sacrificing the proper centralization of control in appropriate supervisory scientist positions by judicious use of competent administrative assistants who act as business managers. The Kelly Committee reports[9] this as a "...common pattern (that) has evolved from long years of experience and (for which) there are compelling reasons... ."

A commonly used criterion for the cost of research is the total cost budget divided by the number of professional employees (cost per professional employee). This figure varied among laboratories visited with size of laboratory, type of work, and extent of supporting facilities included in the research budgets. Laboratories comparable to the Naval Research Laboratory gave figures from 22 to 30 thousand dollars per professional employee. (The FY 1954 figure for the Naval Research Laboratory is 24 thousand dollars.) It was pointed out, however, that a low cost per professional employee does not necessarily indicate efficient management, since the

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productivity of a research laboratory is influenced by the extent to which its professional employees are supported by facilities and services.

The Committee was plaesed to find that the scientific reputation of the Naval Research Laboratory is very good among commercial laboratories. The only critical comment was that the Naval Research Laboratory tended to emphasize development work at the expense of the more daring and imaginative longer range research.

Most of those consulted felt that there is little conflict between the Naval Research Laboratory and commercial laboratories, except possibly in the field of development work. Concern was expressed by some that where production was ultimately to result from Naval Research Laboratory work, commercial concerns should be called in early in order to avoid duplication in development. There was some feeling that the Laboratory should devote its effort primarily to problems of military interest which had insufficient commercial application to be sponsored independently by industry.

The majority of the persons with whom laboratory management was discussed were outspoken that the positions of Associate to the Director of Research at the Naval Research Laboratory should be in line positions. Their basis was the large number of Divisions in the Research Department, (12 Divisions now

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reporting to one Director of Research), the large size of the Research Department, (1500 people) and the responsibilities of the positions, responsibilities that cannot be discharged without corresponding authority. It was pointed out also to be organizationally unsound to assign coordinating responsibility to the head of one of the operating units within the coordinating sphere. It is appropriate here to refer to the Buckley Committee Report[13], which stresses the importance to the Laboratory of line functions in Associate Director of Research positions. Also of interest is the report by the Kelly Committee[9] where a similar change of Associate Director of Research positions from staff to line was recommended for the National Bureau of Standards.

In regard to visiting committees, opinions were mixed. It was pointed out that such Committees were valuable for public relations purposes but it was suggested that college professors working in the Laboratory on summer employment contracts could also be an effective public contact.

Attendance at appropriate scientific society meetings was considered to be essential to the professional growth of scientists, and most companies were liberal in sending their professional employees to such meetings at company expense.

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2.4 VISITS TO OTHER DEPARTMENT OF DEFENSE LABORATORIES

In Table 2.2 are listed the visits to other Department of Defense laboratories. Subjects discussed were organization, financial support, and special problems of administration relating to Department of Defense laboratories.

Philosophies of organization vary widely. In one laboratory there are no civilians in line positions above branch head level, while in the other laboratory the top ranking scientist is co-director of the laboratory. Rather tight control of scientific programs is exercised at these laboratories by Washington headquarters. Freedom to determine its own scientific program, which the Naval Research Laboratory enjoys, was looked upon as an important factor in retaining competent scientists.

These laboratories are also concerned with such problems of administration as support of attendance at scientific meetings, and with Civil Service regulations that put government laboratories in an unfavorable competitive situation for hiring and keeping good scientists. It was felt that more cooperative effort among the laboratories was needed to combat some of these conditions.

2.5 VISITS TO THE NAVAL RESEARCH LABORATORY RESEARCH DIVISIONS

Interviews were held with each Division in the Research Department. The list is given in Table 2.3. Subjects discussed

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mainly responsible for the present problem. The almost universal response on this subject was that inter-Divisional coordination of the program was a function of the office of the Director of Research, and that the present Committee should function in this capacity on a continuing basis, full time if need be.

The Scientific Divisions were inclined to be critical of operations in some of the Administrative Divisions. There was a feeling that some units lack the service attitude appropriate to their functions. Constructive suggestions offered were:

(1) partial decentralization (greater than at present)

(2) administrative control by the Research Department

In some cases the Division recognized that corrective steps had already been initiated. While there are some areas that received neither praise nor blame, some - particularly the Electronic Shops, Graphic Arts Branch and the Supply Division - received substantial commendation.

There was considerable variability among Divisions in regard to outside contacts. In most cases contacts with the Navy Materiel Bureaus were close and cordial. Those with the Office of Naval Research on the other hand were few, and mutual understanding in some cases was slight. The opinion was expressed that contacts with other Navy laboratories are less than common interests would justify, except in the field of underwater sound where inter-laboratory liaison is very good.

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2.6 VISITS TO NRL ADMINISTRATIVE DIVISIONS

Visits and interviews were held with each of the six Divisions of the Administrative Department. The list is given in Table 2.3. In the time available it was not possible to make a detailed survey of these Divisions. However, certain general observations may be made. The service attitude is for the most part very good. Most of the complaints of the Research Divisions were recognized and corrective steps were being taken where possible. In some cases there is a tendency to build up capabilities for meeting all the requirements that the Research Department may have, without adequate reliance on other facilities for special services.

2.7 OTHER INTERVIEWS WITHIN THE LABORATORY

As indicated in Table 2.3, interviews were held with a number of persons in the Laboratory. The subjects discussed were appropriate to the offices visited. Some of the pertinent points made were that

(1) inter-Divisional coordination of the scientific program needs to be improved,

(2) as far as the Research Department is concerned the duties of Program Officers are essentially liaison,

(3) the Laboratory should broaden its systems viewpoint and

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(4) emphasis should be further shifted in a gradual and orderly manner from electronics to nucleonics and from development to research.

2.8 OTHER SOURCE MATERIAL

The Committee received a number of valuable suggestions in written proposals from various sources in the Laboratory. The Superintendents and several Associate Superintendents submitted analyses of Naval needs in their own and in some cases other fields, together with proposals for meeting these needs. Some of the proposals included major contributions from Branch Heads. The Naval Research Reserve Officers Unit offered suggestions on coordinating the research program. All of the proposals received were carefully reviewed and, where applicable, their substance is included in the Committee's recommendations. Because of their detail they are valuable supplements to the Committee's work, and may be used as guides to more detailed program planning within the framework of the Committee's recommendations.

A considerable amount of material in the form of official documents and public statements, including Program Guidance Reports of the Research and Development Board[16], was reviewed. (See List of References at the end of this report.)

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2.9 GENERAL STATISTICS

A summary of general statistics for the Laboratory is given in Table 2.4. These statistics are of value in analyzing the Laboratory's operations, and in comparing them with those of other laboratories.

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TABLE 2.1

VISITS WITHIN NAVY DEPARTMENT

Office of Naval Research

Rear Adm. C. M. Bolster, Chief
Dr. E. R. Piore, Deputy and Chief Scientist
Dr. R. M. Robertson, Science Director
Dr. H. Hall, Technical Director, Naval Sciences Division

Chief of Naval Operations

Rear Adm. M. E. Curts, Assistant Chief (Readiness)
Rear Adm. G. C. Wright, Director, Atomic Energy Division
Rear Adm. J. H. Sides, Director, Guided Missiles Division
Capt. W. F. Raborn, Assistant Director
Branch Heads

Bureau of Aeronautics

Rear Adm. R. S. Hatcher, Assistant Chief for Research and Development
Capt. J. N. Murphy, Executive Director for Research and Development

Bureau of Ordnance

Rear Adm. W. S. Parsons, Deputy and Assistant Chief
Capt. M. R. Kelley, Assistant Chief for Research

Bureau of Ships

Rear Adm. H. G. Rickover, Director, Nuclear Power Division; (Chief, Naval Reactors Branch, Reactor Division, Atomic Energy Commission)
Capt. F. R. Furth, Assistant Chief for Electronics, (Director, Naval Research Laboratory 1949-1952)
Capt. W. L. Pryor, Assistant Chief for Research and Development

Operational Development Force

Rear Adm. F. I. Entwistle, Commander
Capt. A. S. Hill, Chief of Staff
Capt. W. L. Tagg, Project Coordinator
Dr. O. D. Boodman, OEG Representative
Staff Department Heads

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TABLE 3.2

VISITS TO OTHER LABORATORIES

Industrial and Educational

Bell Telephone Laboratories, Murray Hill, New Jersey
Dr. R. Bown, Vice President and Director of Research
Mr. W. H. Martin, Director, Apparatus Development
Mr. W. H. Doherty, Head, Electrical Communications Research
Mr. A. G. Jensen, In Charge of Television Research

Minnesota Mining and Manufacturing Company
Dr. H. N. Stephens, Vice President and Director of Research
Member, Naval Research Advisory Committee

Radio Corporation of America, Princeton
Dr. E. W. Engstrom, Vice President in Charge of Research
Dr. I. Wolff, Director, Radio Tube Laboratory
Dr. D. H. Ewing, Head of Research Services
Mr. Zemke, Head of Administration

Union Carbon and Carbide Corporation
Dr. A. B. Kinzel, President, Union Carbide and Carbon Research Laboratories, Inc.
Vice President, Electro Metallurgy Division, Union Carbide and Carbon Corporation
Chairman, Naval Research Advisory Committee

University of California
Dr. H. A. Schade, Professor, Mechanical Engineering
(Director, Naval Research Laboratory 1946-1949)

Westinghouse Electric Corporation, Pittsburgh
Dr. J. A. Hutcheson, Director
Vice Chairman, Naval Research Advisory Committee
Dr. C. Zener, Associate Director
Mr. E. X. Hallenberg, Assistant Director

Military

Naval Ordnance Laboratory, White Oaks, Maryland
Dr. R. D. Bennett, Technical Director

Signal Corps Engineering Laboratory, Fort Monmouth
Col. F. F. Uhrhane, Commanding Officer
Mr. E. Nelson, Technical Director
Dr. H. Zahl, Director of Research
Col. P. O. Langguth, Deputy for Management
Col. E. L. Littel, Deputy for Development and Procurement
Mr. S. E. Petrillo, Director of Engineering
Mr. J. Slattery, Chief Engineer, Evans Signal Laboratory
Mr. W. S. Marks, Jr., Chief Engineer, Coles Signal Laboratory
Mr. J. Kravitz, Chief, Liaison Office
Mr. E. Petrillo, Comptroller

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TABLE 2.3

VISITS WITHIN
the
NAVAL RESEARCH LABORATORY

Office of the Director
- Director
- Senior Program Officer for Radio and Sound
- Senior Program Officer for Nucleonics and Materials

Department of Research
- Director of Research
- Special Consultant, Dr. E. Klein
- Program Records Office
- Mechanics Division
- Electricity Division
- Chemistry Division
- Metallurgy Division
- Radiation Division
- Nucleonics Division
- Optics Division
- Sound Division
- Radio I Division
- Radio II Division
- Radio III Division
- Systems Division

Chesapeake Bay Annex

Department of Administration
- Director of Administration
- Engineering Services Division
- Administrative Services Division
- Supply Division
- Public Works Division
- Personnel Division
- Comptroller's Office
- Technical Information Division
- Management Engineer

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TABLE 2.4

GENERAL STATISTICS
(as of September 1953)

Budget	
Research Navy	$ 7,900,000
Other	8,900,000
Maintenance and Operation	8,300,000
Equipment	650,000
Miscellaneous	250,000
Total	$26,000,000
Ratio of Total Overhead to Total Budget	31%
Ratio of Total Overhead to Total Direct Salary plus Wages	80%
Ratio of Total Overhead to Total Direct Cost	45%
Personnel	
Total Employees	3205
Total Professional Employees in Scientific Department	1080
Total Employees in Research Department	1540
Miscellaneous	
Average Direct Salary	$ 5,650
Cost per Research Department Employee per year	17,000
Cost per Professional Employee per year	24,000

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CHAPTER 3

PROGRAM

3.1 INTRODUCTION

Of the many laboratories in the Navy Department, the Naval Research Laboratory holds a unique position in that its charter permits it to conduct very broad programs of research. Each of the Materiel Bureaus has various laboratories to work on its more immediate research and engineering problems; it is the responsibility of the Naval Research Laboratory to carry on long range research to support the Bureau laboratories' programs and also to cover those fields of research not covered by these laboratories. The result is that the Naval Research Laboratory engages in research over a very broad range of scientific subjects, more than any other laboratory within the Department of Defense. This can be a potential weakness in that the effort may be "spread too thin".

It is natural and desirable that certain fields have been emphasized at the Laboratory with the result that a very good reputation has been gained in a limited number of fields. Its most important contribution to the Navy has been in the field of radar in which an enviable reputation has been maintained for the past 15 years. More recently the Laboratory's

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contribution to the atomic weapons program has met with commendation. Similarly, the Laboratory has established a very good reputation in low-frequency sonar, upper atmosphere research, casting and welding, lubrication and personnel protection.

In establishing the aims for a long-range program it is necessary to take into consideration the personnel and mechanical facilities which have been built up through the years. At the same time it is necessary to analyze and determine in so far as possible the needs of the future so that changes in program can be made to meet these needs. Care must be exercised that the momentum of the past does not undesirably determine the future program and that a reputation, no matter how carefully and excellently built up, be continually maintained by new contributions.

By a consideration of these factors as well as by an analysis of the present scientific program and an estimate of the Navy's future needs, the Committee arrived at a proposed scientific program and distribution of effort within that program.

3.2 PRESENT SCIENTIFIC PROGRAM

The scientific work of the Naval Research Laboratory is currently broken down into a group of programs based primarily on scientific subjects. Although it is also possible to make

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a breakdown on the basis of end product, operational requirements, or a combination of all three, it has been considered that the scientific subject breakdown has been the most useful, the most flexible, and the most appropriate to a research laboratory. The present breakdown[4], shown in Table 3.1, consists of eleven major categories and 84 programs. Under these programs there currently exist about 500 problems.

3.3 PROPOSED SCIENTIFIC PROGRAM

Detailed analysis of the work currently being carried on at the Laboratory indicated the desirability of modifying the program in order to give proper emphasis to the fields of work, to consolidate closely related programs and to decrease the total number so as to simplify analysis. The area of research covered by each of the proposed programs is the same as presently defined[4] with some exceptions. The old category of General Science has been eliminated; four new ones - Atmosphere and Astronomy, Mathematics, Solid State Physics and Applications Research - have been created. The program numbers which follow are those of the reference[4].

Atmosphere and Astronomy includes the complete Atmospheric Electricity (E 08), Optics of the Atmosphere (N 03), Meteorology (P 05) and Upper Atmosphere (P 06) programs; it also includes the applicable portions of the Radiochemistry (C 10) and the Propagation (R 11) programs.

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Mathematics includes the complete Applied Mathematics program (P 10) and a new program on Computers. The latter involves the development, maintenance, and application of digital and analog computers required by the Laboratory for the conduct of its scientific work. Specifically included is the further development and application of the NAREC. This program was previously carried as parts of P 10 and R 10.

Solid State Physics includes the program on Semi-Conductors (part of P 09), Electric and Magnetic Materials (E 06 and part of R 11), Luminescent Materials (P 11 and part of P 09), Growth and Structure of Solids (parts of P 08 and P 09), and Cryogenics (P 02).

In one case work in several different scientific areas is so closely allied to a common objective that consolidation under one program is desirable. This program includes Data Processing (R 07 and part of R 10), Engineering Psychology (Y 04, 05, and 06 and parts of R 10 and S 06), and Systems Analysis (Y 01, 02, 03 and the addition of a program in operational research). The new field thus established is identified in the proposed program as Applications Research. It is anticipated that the Applications Research program will be a continuation of the present activities in these scientific areas until need for reorientation becomes apparent.

The proposed scientific program, shown in Table 3.2, has a total of 62 programs. The conversion of the old problem numbers to the new program numbers is shown in Table 3.3.

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3.4 PRESENT DISTRIBUTION OF EFFORT

In order to determine the distribution of effort among the various present programs, it was necessary to analyze the hundreds of existing problems and group them into a reasonably small number of categories. Such analyses have been made both by RN (Research Navy funds supplied by the Office of Naval Research) and by total support as follows:

(1) Character of work (i.e., whether it is basic research, supporting research, applied research development, or test and evaluation) by Scientific Divisions.

(2) Character of work by program.

(3) Program analysis by Division.

(4) Detailed analysis of program.

(5) Summary by planning objectives.

(6) Major program areas by scientific subject and end product.

In the discussion which follows, dollar presentations are used for the detailed breakdowns and percentages for the overall. With the exception of a few programs such as upper atmosphere and nuclear weapons which involve large contracts and material costs, there is a good correspondence between the dollar and the personnel distributions.

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By Character of Work

One of the important criteria by which a laboratory may be judged is the character of the work being conducted. In making such an analysis for the Laboratory the following definitions were used[8].

Basic Research. That type of research which is directed toward, and undertaken primarily for the purpose of, increasing scientific knowledge.

Supporting Research. That type of research which is directed toward, and undertaken primarily for, obtaining scientific knowledge needed for a specific requirement.

Applied Research. That type of research which is directed toward practical application of scientific knowledge.

Development. The systematic use of scientific knowledge directed toward the production of useful materials, devices, systems, or processes other than design and production engineering.

Test and Evaluation. Test and evaluation of a completed piece of equipment or system as well as the evaluation of previously developed procedures or methods.

An analysis of the character of work carried on by the various scientific divisions is shown in Table 3.4 for the work which is RN supported (Office of Naval Research funded)

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and in Table 3.5 for work supported by all funds. Too much credit should not be placed on the accuracy of these distributions since the division between the different categories is in many cases not clear. From these tables the following observations may be made.

(1) The character of work differs widely among Divisions.

(2) RN funds are used primarily for Basic, Supporting and Applied Research.

(3) Outside funds are used primarily for Applied Research and Development.

(4) The ratio of RN to outside support varies widely among Divisions.

(5) Applied Research and Development each constitute about one-third of the total program.

(6) Work directed toward applications is in excess of 90% of the total program.

(7) Research of a fundamental nature constitutes about one-fourth of the Laboratory's program.

By Program

The character of work was also analyzed by program and is shown in Table 3.6. From this table the following observations can be made.

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(1) The character of the work differs widely among the programs.

(2) About one-third of the Laboratory's total effort is in the radio program. 44%

(3) The nuclear program and the sound program are respectively about one-seventh and one-tenth of the Laboratory's total effort. 20%

(4) The greatest effort in work of a fundamental nature (basic and supporting research) is in the atmosphere and astronomy, nucleonics, radio and solid state programs and of these the nucleonics program is approximately twice any of the others. ??????

(5) Approximately one-half of the Laboratory's total effort in work of a more applied nature (applied research and development) is in the fields of radio and sound of which about three-quarters is in radio. The work of this nature in nucleonics is almost as great as that in sound.

(6) About 40% of the Laboratory's total effort in test and evaluation is in radio.

(7) The ratio of the fundamental to the applied work is greatest in the atmosphere and astronomy, mathematics, metallurgy, and solid state programs. In the nucleonics program the ratio is about unity.

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(8) The ratio of the applied to the fundamental is highest in the electricity, radio, sound, and systems programs.

An analysis of the distribution of effort in the scientific program by Division is given in Table 3.7. This table shows, among other things, the extent to which each Division works in more than one field of science.

A detailed analysis of the program by source of support is given in Table 3.8.

By Planning Objectives

Since the overall Navy research and development program is based on planning objectives which are established by the Chief of Naval Operations[21], the scientific program was also analyzed on this basis. This breakdown is the basis of all research and development budgeting since it is the important one from the military point of view. It should be pointed out that the line of demarcation between various subjects is not always clear. The summary by this breakdown is shown in Table 3.9 from which the following observations can be made.

(1) The supporting research and development objective is, as might be expected, the most heavily supported.

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(2) In the warfare areas the largest support is in the air defense objective. This amounts to about one-fifth of the Laboratory's total effort.

(3) The anti-submarine objective is the next largest and it amounts to about one-sixth of the overall Laboratory effort.

(4) The atomic warfare objective, the third largest, amounts to about one-tenth of the Laboratory's total effort.

By Major Program Areas

The previous analyses (represented by Tables 3.4 through 3.9) have presented data based on a large number of scientific subjects. Although such data are helpful, it is difficult to establish long range aims on the basis of so many items. Accordingly, another analysis was made arbitrarily based on five major program areas - radio, sound, materials, nuclear and miscellaneous. The overall program in these five areas is broken down by scientific subject in Table 3.10 and by end product in Table 3.11. The end product breakdown identifies with one major program area all work supporting the program in that area; some of this work may be performed in another major program area (e.g. work on crystals in the Materials area for sonar transducers is listed in the Sound area).

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For ease of comparison a summary of Tables 3.10 and 3.11 is given in Table 3.12. The following observations may be drawn from this table.

(1) The work in radio and sound comprise about one-half of the Laboratory's program on the basis of scientific subject and somewhat more on the basis of end product.

(2) The amount of work aimed at a nuclear end product is about one-fifth of the total Laboratory program whereas it is a little more than one-seventh on the basis of scientific subject.

(3) In the Major Program areas, both with respect to scientific subject and end product, the ratio of RN supported work to total work is considerably more uniform than it is among the Divisions (Tables 3.4 and 3.5).

(4) About one-half of the Materials program supports end products in the four other areas.

3.5 PROPOSED DISTRIBUTION OF EFFORT

This section considers and makes recommendations for the distribution of the Laboratory's effort in FY 1957 on the basis of continuing to operate at the present level (Table 2.4). The FY 1957 was selected as the aiming point because this was as far as it was felt wise to forecast. Considerations of increases or decreases in operating level are made in Sec. 3.6.

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By Character of Work

The Naval Research Laboratory is a research laboratory. An analysis of the program shows that 60% of the present effort is in the fields of basic, supporting, and applied research with the remaining 40% in development, test and evaluation.

The Committee recommends that there be a gradual shift of emphasis so that basic, supporting, and applied research be at least two-thirds of the Laboratory's total effort.

By Major Program Areas

The Committee feels that long range aims can be established only in broad scientific areas and that details should be worked out on a continuing basis within the broad framework. Accordingly, the proposed program distribution is discussed only by five major areas - Nuclear, Radio, Sound, Materials, and Miscellaneous.

Nuclear. With the increased availability and the diversified applications of atomic weapons as well as the still greater potentiality of thermonuclear weapons, it is clear that nuclear weapons are becoming of increasingly greater importance to the Nation and of major importance to the Navy. At the present time the Naval Research Laboratory is the only laboratory in the Navy which is engaged in the broader phases of the weapons program. The Laboratory's experience, background, and present activity in this field is exceeded by few other laboratories in the country.

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Although the Naval Research Laboratory was perhaps the first laboratory to give consideration to the nuclear power problem[22], in recent years the preoccupation of this Laboratory with nuclear weapons work has kept the nuclear power activities at a low level. During the past year there has been about a five-fold increase in this program but even with this increase the power program is only about one-third of the weapons program. There are many reasons for a large program in nuclear power at the Laboratory, a few of which are as follows.

(1) Nuclear power is in its infancy and is at such a stage where much research and development are required.

(2) Nuclear power is potentially more important to the Navy than to any other user or group of users because the Navy has a greater power requirement than all of the electrical generating stations in the country combined, and because higher powers to obtain higher speeds are a definite Naval requirement.

(3) There is little work in any other Navy laboratory in this field.

The Committee recommends that

(1) the effort in nuclear work including all work pertaining to nuclear end products be increased

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to about one-fourth of the Laboratory's total effort;

(2) the greatest portion of the increase in nuclear work be in the field of nuclear power, including greater emphasis on materials for power systems. The aim should be to produce an approximately equal effort in power and weapons.

Radio. Certain reductions in the field of Radio should be made to permit expansion in Nucleonics as recommended above. This may be accomplished by elimination of some projects, regrouping of others to effect more economical conduct of the program, and diverting an increased portion of the radio work to support of the Nucleonics program.

The greatest reduction should be made by the elimination of the ballistic missile program. The present cost of carrying this program is about one-half million dollars per year but the actual cost, including that of rockets and other expendable equipment, is about one and one-half million dollars per year. Currently all of this is supported by RN funds. This program should not be continued unless outside support is forthcoming. The Committee's discussions with the Chief of Naval Operations and the Bureaus indicated clearly that the Navy will not support this program. There is also no evidence of any support by the Army or Air Force.

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Substantial economies should result from the grouping together of all applications research, and likewise of all radar work.

While the present radio development work is of value to the Bureaus, much of it could be done elsewhere, and greater contributions to Naval radio may be expected from an expanded effort in some areas of supporting research, such as vacuum tubes and related devices. Loss of some Bureau support in radio development may be compensated by increased Bureau support in nuclear engineering.

The Committee recommends that

(1) the effort in radio work, including all work pertaining to radio end products, be decreased by about 15% of the present radio program;

(2) the ballistic missile program be stopped as soon as feasible and in no case later than FY 1957;

(3) there be a reduction in development work;

(4) there be a combining of closely related work now current in different Divisions;

(5) there be an increase in research on vacuum tubes and similar devices;

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(6) the total amount of applications research work be continued at approximately its present level; a moderate program in operational research be established.

Sound. The Laboratory's current program on low frequency search sonar is one of the most important research programs in the Navy (see Sec. 2.2). The Naval Research Laboratory has primary responsibility within the Navy for low frequency search sonar research and development. A considerable program in this field is now underway in the Sound Division. Although much development is necessary in sonar work, there currently is an overemphasis on development at the cost of more fundamental work. Placing more emphasis on research will require bringing in more personnel who are capable of doing such research.

The Committee recommends that

(1) the total effort in Sound be continued at approximately its present level;

(2) the program be reoriented to provide greater emphasis on supporting and applied research and less on development.

Materials. The full exploitation of many scientific principles is limited by the lack of adequate materials. The development of nuclear power, for example, is seriously hampered because of the lack of materials which behave properly at high

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temperatures and under intense radiation fields. The performance of jet and rocket engines is limited by the temperature characteristics of available metals. Material deficiencies also are holding back the development of high velocity guns and semiconductor electronic devices. The importance of these and similar problems warrants increased efforts on materials, but the Committee feels that the overall Materials program, exclusive of materials for nuclear applications, should be held at about its present level.

The Committee recommends that

(1) there be an increase in work on materials for nuclear power application;

(2) the remainder of the Materials program continue at about its present level.

Miscellaneous. The Miscellaneous program consists of Astronomy, Upper Atmosphere, Electricity, Mathematics, Non-Radio Detection, Optics and Personnel Protection. The Upper Atmosphere research program amounts to about 6% ($510,000) of the FY 1954 RN program. The actual cost of the program including the cost of rockets and equipment amounts to about 12% ($1,000,000) of the total Laboratory RN support. This program is currently, and has for the past several years, been operating on the basis of budgeting the running costs and utilizing surpluses for the purchase of rockets and other expendable equipment when, as and

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if surpluses develop. This is an undesirable procedure. The Upper Atmosphere program is of sufficient scientific importance to be continued on a sound basis. It should be a definitely planned part of the program and be kept within specific cost bounds.

The Committee recommends that

(1) the Upper Atmosphere program be continued at approximately its present level of personnel participation and that the total cost of the program, including that of rockets and expendable equipment, be limited to 10% of the total Laboratory direct cost RN budget;

(2) the remainder of the Miscellaneous programs be continued at approximately their present level.

3.6 PROPOSED PROGRAM DISTRIBUTION IN CASE OF INCREASE OR DECREASE

The Committee directive requested that program recommendations be made in case the Laboratory's operating level be increased by 25% or alternatively be decreased by 25%. Since a mobilization plan for the Laboratory already exists, it is assumed that the recommendations are to be limited to peace time considerations.

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25% Increase

While the Committee feels that the Navy's existing research requirements justify such an increase and that the Laboratory facilities could accommodate the increase, the Committee strongly urges that caution be exercised in such an expansion to maintain a high standard of scientific competence. For this reason an increase of 25% in the Laboratory's operating level could only be accomplished in a year or two.

The Committee recommends that

(1) the greatest portion of the increase be in the scientific areas;

(2) the distribution of effort among the scientific programs be approximately the same as that recommended in Sec. 3.5 for the present operating level.

25% Decrease

The Committee feels that the Navy's research requirements in new fields as well as the continuing demands in some of the older fields make any reduction in the Laboratory's scientific program most undesirable. It is assumed that if the Laboratory is forced into a reduction of its present operating level, such a reduction will probably have to be accomplished in a very short period, perhaps as little as three to six months.

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The Committee recommends that

(1) about two-thirds of the decrease be made in the service areas;

(2) the ballistic missile program be dropped immediately;

(3) the remainder, about 15%, be applied uniformly to the research programs such that the aims for the relative distribution of effort among the scientific programs be approximately the same as that recommended in Sec. 3.5 for the present operating level.

3.7 PROGRAM SUPPORT

At present the Naval Research Laboratory gets about one-half of its direct cost financial support from the Office of Naval Research and the other half from various Navy Bureaus, military agencies, and the Atomic Energy Commission. Such a ratio of support has many merits. By this means it is possible to carry on basic research, which is not supported by the Bureaus, and at the same time maintain a familiarity with Navy problems and requirements. This also makes it easier to bring the fruits of the basic work to bear on requirements. In addition such a division of support provides an adequate amount of scientific freedom to do both the kind of research which is

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needed to keep the Navy ahead in the future as well as that which is needed to solve some of its more immediate problems.

There has been a reluctance to discontinue outside supported work in certain areas (e.g., development work) because there was no immediate prospect of replacing it with other outside work. More critical consideration should be given incoming problems from the point of view of how these problems fit into the overall scientific program and long range plans (see Sec. 5.2).

The practice of having an outside laboratory control the program and activities of any group at the Laboratory is most undesirable. During the past few years there have been, and still are, instances at the Laboratory where it has been necessary to accept direction from some outside activity for limited periods of time. There is some tendency for such situations to perpetuate themselves.

The Committee recommends that

(1) the approximate equality between Office of Naval Research support and non-Office of Naval Research support be continued;

(2) no group at the Naval Research Laboratory should, over a long period of time, become the satellite of any outside organization.

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TABLE 3.1

PRESENT

SCIENTIFIC PROGRAM

Chemistry

C 01	Fuels
C 02	Lubricants
C 03	Protective Surfaces
C 04	Personnel Protection
C 05	Electrochemistry
C 06	High Polymers
C 07	Control of Fires
C 08	Colloids
C 09	Surface Chemistry
C 10	Radiochemistry
C 11	Physical Chemical Properties

Electricity

E 01	Electric Power Systems
E 02	Special Controls
E 03	Electric Power Equipment
E 04	Electric Instrumentation
E 05	Magnetic Amplifiers
E 06	Electric and Magnetic Properties
E 07	Engineering Materials
E 08	Atmospheric Electricity

Man-Machine Systems

Y 01	Systems Analysis and Synthesis
Y 02	Organization of Personnel in Information Processing Systems
Y 03	Systems Functional Design and Engineering
Y 04	Human Transmission Properties
Y 05	Machine Displays and Controls
Y 06	Human Engineering of Operational Equipments
Y 07	Psychophysics

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TABLE 3.1 (continued)

Mechanics

F 01	Elasticity
F 02	Experimental Design
F 03	Shock and Vibration
F 04	Strength of Solids
F 05	Penetration Ballistics
F 06	Aerodynamic Ballistics

Metallurgy

M 01	Physical Metallurgy
M 02	Melting and Casting
M 03	Welding
M 04	Corrosion

Nucleonics and Atomic Weapons

H 01	Nuclear Constituents
H 02	Nuclear Structure
H 03	Nuclear Motive Power
H 04	Nuclear Technology
H 05	Atomic Weapons Research
H 06	Atomic Weapons Testing
H 07	Radiation Effects

Optics

N 01	Optical Properties of Materials
N 02	Geometrical Optical Devices
N 03	Optics of the Atmosphere and of the Sea
N 04	Spectroscopy
N 05	Physiological Optics
N 06	Photometry
N 07	Ultraviolet and Infrared Systems

Radio

R 01	Communication
R 02	Detection
R 03	Identification
R 04	Navigation
R 05	Remote Control
R 06	Countermeasures
R 07	Systems
R 08	Electron Tubes Research
R 09	Antennas

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TABLE 3.1 (continued)

Radio (continued)

R 10	Circuits, Components, and Instrumentation
R 11	Propagation
R 12	Precision Location
R 13	Radio Frequency Integration
R 95	Technical Services

Sound

S 01	Transducers
S 02	Propagation
S 03	Harbor, Fleet Base, Coastline Defense
S 04	High-Resolution Sonar
S 05	Recording and Reproduction
S 06	Sonar Electronics
S 07	Sonar Systems
S 95	Technical Services

General Science

P 01	Medical Sciences
P 02	Cryogenics
P 03	Ceramics
P 04	Heat Power
P 05	Meteorology
P 06	Upper Atmosphere
P 07	Photon and Particle Counters
P 08	Electron Microscopy, X-Ray, and Electron Diffraction
P 09	Crystals
P 10	Applied Mathematics
P 11	Luminescent Materials
P 99	Exploratory Research

Special Service Functions

K 01	Shock and Vibration Centralization
K 02	Harbor Defense Information Dissemination

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TABLE 3.2

PROPOSED

SCIENTIFIC PROGRAM

Atmosphere and Astronomy

A 01	Astronomy
A 02	Atmosphere
A 03	Meteorology

Chemistry

C 01	Fuels
C 02	Surface Chemistry and Lubricants
C 03	Protective Coatings
C 04	High Polymers
C 05	Physical and Electro Chemistry
C 06	Radiochemistry
C 07	Molecular Structure
C 08	Personnel Protection

Electricity

E 01	Electric Power Systems
E 02	Electric Power Equipment
E 03	Electric Components and Instrumentation
E 04	Insulating Materials

Mathematics

B 01	Applied Mathematics
B 02	Computers

Mechanics

F 01	Strength of Solids
F 02	Structures
F 03	Shock and Vibration
F 04	Penetration Ballistics
F 05	Heat Power

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TABLE 3.2 (continued)

Metallurgy and Ceramics

M 01	Physical Metallurgy
M 02	Melting and Casting
M 03	Welding
M 04	Corrosion
M 05	Ceramics

Nuclear and Atomic Physics

H 01	Nuclear Constituents and Structure
H 02	Nuclear Instrumentation and Technology
H 03	Nuclear Weapons
H 04	Nuclear Power
H 05	Radiation Effects
H 06	Atomic Physics

Optics

N 01	Physical Optics
N 02	Physiological Optics
N 03	Optical Communication and Detection
N 04	Optical Instrumentation

Radio

R 01	Communication
R 02	Radar
R 03	Radio Identification
R 04	Radio Navigation
R 05	Weapons Control
R 06	Radio Countermeasures
R 07	Radio Propagation
R 08	Electronic Components and Instrumentation
R 09	Antennas

Solid State Physics

P 01	Semi Conductors
P 02	Electric and Magnetic Materials
P 03	Luminescent Materials
P 04	Growth and Structure of Solids
P 05	Cryogenics

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TABLE 3.2 (continued)

Sound

S 01	Sound Propagation
S 02	Sound Signal Analysis and Processing
S 03	Transducers
S 04	Domes and Towed Bodies
S 05	Sonar Systems

Applications Research

Y 01	Data Processing
Y 02	Engineering Psychology
Y 03	Systems Analysis

Special Service Functions

K 01	Shock and Vibration Centralization
K 02	Harbor Defense Information Dissemination
K 03	Miscellaneous Consultant and Technical Services

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TABLE 3.3

PROGRAM CONVERSION LIST

(Where all the problems in a present program convert into the same proposed program, only the program is listed in the Present column)

Present Program and Problems	Proposed Program
C 01	C 01
C 02	C 02
C 03	C 03
C 04	C 08
C 05	C 05
C 06-09, 16, 18, 21	C 04
C 06-11	C 08
C 07	C 08
C 08-01	C 02
C 09	C 02
C 10-01, 07	C 06
C 10-02	A 02 ?
C 11-02, 06	C 05
C 11-04	C 01
C 11-07	C 07
E 01-05, 07, 08, 09, 11, 13	E 01
E 01-12	E 03
E 02	E 02
E 03-04	E 03
E 03-25, 34	E 02
E 04	E 03
E 05	E 03
E 06	P 02
E 07	E 04
E 08	A 02

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TABLE 3.3 (continued)

Present Program and Problems	Proposed Program
F 01	F 01
F 02	F 02
F 03-01, 04, 05, 06, 16, 20, 38, 45, 54, 66, 71, 73, 74, 76, 78, 79, 80, 81, 82, 83, x	F 03
F 03-07, 50, 84, b	F 02
F 04-01	F 03
F 04-02, 03, 04, 05, 06, 07, 08, 09	F 01
F 05	F 04
H 01	H 01
H 02-01, 02	H 01
H 02-04	H 06
H 02-05	H 03
H 02-03, 06, 07	H 02
H 03	C 06
H 04-01, 02, 03, 05, 07	H 02
H 04-04	C 06
H 04-06, 08, 13	H 03
H 04-09, 10, 11, 12	H 04
H 05-01	H 01, H 03
H 06	H 03
H 07	H 05
H 08	H 03
M 01	M 01
M 02	M 02
M 03	M 03
M 04	M 04
N 03-14	A 02
N 03-17, 20, 22	N 04
N 03-19	N 03
N 04-05	N 01

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TABLE 3.3 (continued)

Present Program and Problems	Proposed Program
N 05-04	N 01
N 05-05	N 02
N 06-18, 24, 25, 26	N 01
N 06-19	N 04
N 07	N 03
P 01-13	P 01
P 02	P 05
P 03-01	M 05
P 04	F 05
P 05	A 03
P 06-01	A 01
P 06-06, 07, 08, 09, 10, 12	A 02
P 06-13, 14	N 04
P 07	H 02
P 08-03	C 07
P 08-05	P 04
P 09-01	P 03
P 09-02, 08	P 01
P 09-04, 06, 07	P 04
P 10-01	B 02
P 10-02, 05	B 01
P 11-01	P 03
P 11-03, 04	H 02
R 01	R 01
R 02-22, 23, 42, 50, 53, 55, 56, 57, 58, a	R 02
R 02-59	A 02
R 03	R 03
R 04-12, 42, 45, 50, 51, 53, a	R 04
R 04-52	N 03

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TABLE 3.3 (continued)

Present Program and Problems	Proposed Program
R 05	R 05
R 06	R 06
R 07-16, 25, 26, 30, 42, 44, 45, 50, a, b	Y 01
R 07-41, 49	R 08
R 07-46	R 01
R 07-51	R 02
R 08	R 08
R 09-01, 29, 32, 33, 42, 49, 51, 52, 53, 54, 56, 57	R 09
R 09-44	R 08
R 10-12, 77, 79	F 03
R 10-07, 26, 38, 39, 40, 43, 49, 61, 62, 63, 67, 68, 69, 72, 73, 74, 78, 80	R 08
R 10-55	Y 02
R 10-57	S 05
R 10-60	B 02
R 10-82	Y 01
R 11-01, 02, 07, 12, 13, 17, 20	R 07
R 11-09	A 01
R 11-10, 11	R 02
R 11-14	P 02
R 12	R 02
R 13	R 02
R 95	K 03
S 01	S 03
S 02	S 01
S 04	S 05
S 05	S 02
S 06-07, 08	S 02
S 06-10	Y 02
S 07-01, 03, 12, 13, 16, 18, 19, 21, 22, 23	S 05
S 07-04, 20	S 04
S 07-17	S 02
S 95	K 03

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TABLE 3.3 (continued)

Present Program and Problems	Proposed Program
Y 01	Y 03
Y 02	Y 03
Y 03	Y 03
Y 04	Y 02
Y 05	Y 02
Y 06	Y 02

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TABLE 3.4

CHARACTER OF WORK BY DIVISION

RN SUPPORT - FY 1954
(In thousands of dollars)

	Basic Research	Supporting Research	Applied Research	Development	Test and Evaluation	Total	% of NRL Total
Nucleonics	269	274	57			590	8
Radiation	70	245	185			500	6
Chemistry		142	382			524	7
Electricity	197	114	87			398	5
Metallurgy	90	375	140			605	8
Optics	231	63	152			446	6
Mechanics	70	206	222			498	6
Sound		249	573	175		997	12
Systems		20	122	23		165	2
Radio I	360	480	834	67		1741	22
Radio II			424	31		455	6
Radio III		136	757			893	12
Miscellaneous				16		16	
TOTAL	1277	2304	3935	312		7828	100
%	17	29	50	4		100	

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TABLE 3.5

CHARACTER OF WORK BY DIVISION

TOTAL SUPPORT - FY 1954
(In thousands of dollars)

	Basic Research	Supporting Research	Applied Research	Development	Test and Evaluation	Total	% of NRL Total	% of Research Dept. Personnel
Nucleonics	282	326	222	58	40	928	5	5
Radiation	70	515	405	225		1215	7	6
Chemistry		142	405	595	80	1222	7	9
Electricity	197	129	185	174	137	822	5	7
Metallurgy	90	499	309	75		973	6	5
Optics	231	132	270	273	117	1023	6	6
Mechanics	70	268	465	270	228	1301	8	7
Sound		249	573	977	56	1855	11	9
Systems		20	122	23		165	1	1
Radio I	387	590	1342	649		2968	18	14
Radio II		20	424	1564	480	2488	15	16
Radio III		136	994	593	115	1838	11	14
Miscellaneous				46		46		
TOTAL	1327	3026	5716	5522	1253	16844	100	100
%	8	18	34	33	7	100		

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TABLE 3.6

CHARACTER OF WORK BY PROGRAM

FY 1954
(In thousands of dollars)

		Basic Research	Supporting Research	Applied Research	Development	Test and Evaluation	Total	% of NRL Total
A	Atmo. & Astro.	466	204	127	146		943	6
C	Chemistry	25	196	400	568	97	1286	7
E	Electricity		11	185	174	137	507	3
B	Mathematics	30	123	108			261	2
F	Mechanics	40	130	362	187	206	925	5
M	Metallurgy		360	225	52		637	4
H	Nuclear	378	845	788	401	140	2552	15
N	Optics	74	72	84	147	17	394	2
R	Radio		561	2365	2539	499	5964	35
P	Solid State	303	276	166	41		786	5
S	Sound		209	524	977	1	1711	10
Y	Applications Research		60	331	244	79	714	4
K	Services				46	121	167	1
	TOTAL	1316	3047	5665	5522	1297	16847	
	%	8	18	34	33	7	100	100

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TABLE 3.7

PROGRAM WORK BY DIVISION

FY 1954
(In thousands of dollars)

	Atmo. and Astro.	Chemistry	Electricity	Mathematics	Mechanics	Metallurgy and Ceramics	Nuclear and Atomic Physics	Optics	Radio	Solid State	Sound	Applications Research	Special Service	Division Total
Nucleonics		39					892							931
Radiation							1215							1215
Chemistry	19	1190								18				1227
Electricity			507							315				822
Metallurgy						637	17			319				973
Optics	139	40					417	387		39				1022
Mechanics	223	17		131	925				2					1298
Sound											1711	89	55	1855
Systems												165		165
Radio I	532							7	2294	95		14	25	2967
Radio II	30								2118			314	26	2488
Radio III				130			11		1550			132	15	1838
Miscel.													46	46
TOTAL	943	1286	507	261	925	637	2552	394	5964	786	1711	714	167	16847
%	6	7	3	2	6	4	15	2	35	5	10	4	1	100

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TABLE 3.8

DETAILED ANALYSIS BY PROGRAM
(FY 1954)

	K$		%		
	RN Support	Total Support	Prog RN / Prog Tot	Prog RN / Tot RN	Prog Tot / NRL Tot
A Atmosphere & Astronomy					
A 01 Astronomy	200	200			
A 02 Atmosphere	490	500			
A 03 Meteorology	30	243			
A Total	720	933	75	9	6
C Chemistry					
C 01 Fuels	25	158			
C 02 Surface Chem. & Lubrication	110	207			
C 03 Protective Coatings	87	151			
C 04 High Polymers	33	60			
C 05 Physical & Electro Chemistry	71	97			
C 06 Radiochemistry	25	87			
C 07 Molecular Structure	63	63			
C 08 Personnel Protection	133	463			
C Total	547	1286	43	7	7
E Electricity					
E 01 Electric Power Systems	12	103			
E 02 Electric Power Equipment		160			
E 03 Electric Components & Instr.	44	132			
E 04 Insulating Materials	42	112			
E Total	98	507	18	1	3
B Mathematics					
B 01 Applied Mathematics	57	70			
B 02 Computers	191	191			
B Total	248	261	95	3	2

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TABLE 3.8 (continued)

	K$		%		
	RN Support	Total Support	Prog RN / Prog Tot.	Prog RN / Tot RN	Prog Tot / NRL Tot
F Mechanics					
F 01 Strength of Solids	109	259			
F 02 Structures	18	278			
F 03 Shock and Vibration	64	187			
F 04 Penetration Ballistics	104	144			
F 05 Heat Power	57	57			
F Total	352	925	38	5	6
M Metallurgy and Ceramics					
M 01 Physical Metallurgy	159	259			
M 02 Melting and Casting	65	125			
M 03 Welding	44	104			
M 04 Corrosion	40	109			
M 05 Ceramics	20	40			
M Total	328	637	51	4	4
H Nuclear and Atomic Physics					
H 01 Nuclear Const. and Struct.	465	550			
H 02 Nuclear Instr. and Techn.	159	363			
H 03 Nuclear Weapons	182	1184			
H 04 Nuclear Power	170	265			
H 05 Radiation Effects	70	140			
H 06 Atomic Physics	50	50			
H Total	1096	2552	43	14	14
N Optics					
N 01 Physical Optics	61	63			
N 02 Physiological Optics	12	12			
N 03 Optical Comm. and Det.	41	192			
N 04 Optical Instrumentation	92	127			
N Total	206	394	53	3	2

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TABLE 3.8 (continued)

		K$		%		
		RN Support	Total Support	Prog RN / Prog Tot	Prog RN / Tot RN	Prog Tot / NRL Tot
R	**Radio**					
R 01	Communications	40	452			
R 02	Radar	656	1669			
R 03	Identification		220			
R 04	Radio Navigation	115	287			
R 05	Weapons Control	583	988			
R 06	Countermeasures	73	570			
R 07	Propagation	164	208			
R 08	Electronic Comp. and Instr.	475	719			
R 09	Antennas	28	851			
R Total		2134	5964	36	27	35
P	**Solid State**					
P 01	Semi-Conductors	84	111			
P 02	Elect. and Magn. Materials	214	269			
P 03	Luminescent	76	91			
P 04	Growth and Struct. of Solids	124	139			
P 05	Cryogenics	175	175			
P Total		673	785	87	9	5
S	**Sound**					
S 01	Sound Propagation	121	121			
S 02	Signal Analysis & Processing	209	219			
S 03	Transducers	209	244			
S 04	Domes and Towed Bodies		139			
S 05	Sonar Systems	368	988			
S Total		907	1711	53	12	10
Y	**Applications Research**					
Y 01	Data Processing	168	353			
Y 02	Engineering Psychology	155	196			
Y 03	Systems Analysis	165	165			
Y Total		488	714	68	6	4

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TABLE 3.8 (continued)

	K$		%		
	RN Support	Total Support	Prog RN / Prog Tot	Prog RN / Tot RN	Prog Tot / NRL Tot
K Miscellaneous					
K 01 S & V Centralization		30			
K 02 Harbor Defense	16	16			
K 03 Misc. Consult. & Tech. Service		121			
K Total	16	167	1		1
TOTAL	7813	16836	46	100	100

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TABLE 3.9

SUMMARY BY PLANNING OBJECTIVES
(FY 1954)

		RN Funds		Total Funds	
		%	K$	%	K$
AD	Air Defense	14	1060	21	3570
AS	Antisubmarine	16	1260	15	2610
AW	Atomic Warfare	3	250	9	1590
CA	Combat Air Support	8	590	7	1200
CW	Chemical Warfare				50
IO	Intelligence Operations	1	40	3	420
PO	Personnel Operations		60	2	260
SC	Sea Combat	5	390	8	1320
SO	Supply & Maintenance	1	90	1	170
SW	Submarine Operations	1	100	2	310
SR	Supporting R & D	34	2660	24	4010
BR	Basic Research	17	1330	8	1330
	TOTAL	100	7830	100	16840

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TABLE 3.10

MAJOR PROGRAM AREAS
by
SCIENTIFIC SUBJECT
FY 1954
(In thousands of dollars)

		RN						TOTAL					
		Radio	Sound	Material	Nuclear	Misc.	Total	Radio	Sound	Material	Nuclear	Misc.	Total
A	Atmo. & Astr.					720	720					933	943
C	Chemistry			547			547			1286			1286
E	Electricity					98	98					507	507
B	Mathematics					248	248					261	261
F	Mechanics			352			352			925			925
M	Metallurgy			328			328			637			637
H	Nuclear				1096		1096				2552		2552
N	Optics					206	206					394	394
R	Radio	2134					2134	5964					5964
P	Solid State			673			673			786			786
S	Sound		907				907		1711				1711
Y	Applications Research	488					488	714					714
K	Services					16	16					167	167
	TOTAL	2622	907	1900	1096	1288	7813	6678	1711	3634	2552	2272	16847
	%	34	12	24	14	16	100	40	10	22	15	13	100

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TABLE 3.11

MAJOR PROGRAM AREAS
by
END PRODUCT
FY 1954
(In thousands of dollars)

		RN						TOTAL					
		Radio	Sound	Material	Nuclear	Misc.	Total	Radio	Sound	Material	Nuclear	Misc.	Total
A	Atmo. & Astro.	370			20	330	720	385			30	528	943
C	Chemistry			340	103	104	547			646	300	340	1286
E	Electricity					98	98		25		45	437	507
B	Mathematics	83		75		90	248	83		88		90	261
F	Mechanics	2		273		77	352	96	20	334	260	215	925
M	Metallurgy			298	30		328			552	85		637
H	Nuclear				1096		1096				2552		2552
N	Optics					206	206					394	394
R	Radio	2134					2134	5964					5964
P	Solid State	61	192	293	44	83	673	71	130	440	50	95	786
S	Sound		907				907		1711				1711
Y	Applications Research	488					488	714					714
K	Services					16	16	66	55	30		16	167
	TOTAL	3138	1099	1279	1293	1004	7813	7379	1941	2090	3322	2115	16847
	%	40	14	16	17	13	100	44	11	12	20	13	100

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TABLE 3.12

MAJOR PROGRAM AREAS

SUMMARY

(FY 1954)

	Scientific Subject		End Product	
	RN	Total	RN	Total
RADIO	34%	40%	40%	44%
SOUND	12%	10%	14%	11%
MATERIALS	24%	22%	16%	12%
NUCLEAR	14%	15%	17%	20%
MISCELLANEOUS	16%	13%	13%	13%

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CHAPTER 4

ORGANIZATION

4.1 INTRODUCTION

The Committee believes that the best organizational structure is the simplest one that will permit the necessary administrative actions to be performed efficiently and effectively. This means that as much authority and responsibility as possible be given to each organizational level, that this authority and responsibility be clearly defined, that there be a single, short chain of command, and that no one in the chain be burdened with too many units directly under him. The Committee believes also that organizational changes should not be made unless there is strong justification.

4.2 OVERALL LABORATORY ORGANIZATION

The present organizational structure of the Laboratory is shown in Table 4.1[17]. The major units are the Research Department which consists solely of Scientific Divisions, the Administrative Department which provides the general administration and major service facilities, and the Office of the Comptroller.

Appreciable sentiment was found in some quarters of the Research Department for transferring to that Department those

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Divisions of the Administrative Department whose work is intimately tied into the Research Department operations, particularly Engineering Services, Technical Information and Personnel. The Committee debated this at length and concluded that the Research Department should not be burdened with the administration of these Divisions. Most of the specific complaints that generated the sentiment would be eliminated by changes that are recommended in later sections of this report.

The Committee recommends that

(1) the present top organizational structure consisting of a Director of Research and a Director of Administration, both reporting to the Director, be retained;

(2) the Department of Administration retain all service functions it now performs.

4.3 PRESENT RESEARCH DEPARTMENT ORGANIZATION

The Research Department consists of three Associates to the Director of Research acting in a staff capacity, and twelve Division Superintendents reporting to the Director of Research. The three Associates are also Division Superintendents. The present Division and Branch Organizations are shown in Tables 4.2, 4.3 and 4.4. There are approximately 1500 personnel in the Research Department.

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4.4 PROPOSED RESEARCH DEPARTMENT ORGANIZATION

At present work of similar nature is being carried out in several Divisions; for example, applications research in Radio II, Radio III, Sound and Systems Divisions; solid state physics in Electricity, Metallurgy and Radio I Divisions; upper atmosphere research in Radio I and Optics Divisions. Such work is not now adequately coordinated. Each of the areas mentioned above involves at least two of the Associates to the Director of Research and coordination would not be easy if the responsibility and authority were assigned to the Associates. Coordinating committees have been suggested for handling such situations. While such committees can be effective for interchange of information, they cannot perform all the necessary functions. Essentially such committees are now in existence in some areas.

Confusion and duplication on several administrative matters now exist because of the lack of clear lines of authority and responsibility. The Superintendents are frequently uncertain as to whether a particular matter should be taken up with the Director, the Director of Research, the Program Officer, the Associate to the Director of Research, or possibly the Comptroller. As a result the Superintendents sometimes take the matter up with all five.

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In the following paragraphs the Committee makes recommendations which it feels will effect improvement in these matters and bring about better overall administration of the Research Department.

Director of Research

The Director of Research is responsible to the Director for the scientific program of the Laboratory[17]. To carry out this assignment he must have responsibility and concomitant authority within overall policies and limitations set by the Director over

(1) long range and broad overall research planning and programming;

(2) conduct of the overall research program;

(3) acceptance or rejection of new problems and modification of existing ones;

(4) Research Department budgeting;

(5) Research Department expenditures within the budget;

(6) promotion and hiring of Research Department personnel.

At present these functions are being performed by various groups in both Departments and are not adequately controlled, coordinated, or carried out. The need for more

[17] This could conceivably apply to Bureau problems if trend away from applied problems is encouraged.

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coordination and better top-level, broad range planning was frequently expressed by scientists in the Research Department.

The Committee recommends that the Director of Research have responsibility and concomitant authority within overall policies and limitations set by the Director over

(1) long range and broad overall research planning and programming;

(2) conduct of the overall research program;

(3) acceptance or rejection of new problems and modification of existing ones;

(4) Research Department budgeting;

(5) Research Department expenditures within the budget;

(6) promotion and hiring of Research Department personnel.

Associate Directors of Research

The Committee feels that no one man is capable of performing the above responsibilities for an organization having the size and range of work of the Naval Research Laboratory. Yet it recognizes that the overall responsibility must reside in one man, which requires that this man have adequate assistance. The Associates have attempted to give this assistance for the past several months but this has taken a very appreciable amount of their time and has resulted in considerable neglect to the

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Divisions with which they are associated. Continued responsibilities of this sort could not but have a very adverse effect upon the work of these Divisions. Furthermore, it is undesirable and administratively unsound for an Associate to act as a reviewing official over his own activities as a Division Superintendent.

Organizational changes that could be made to remedy the situation are (1) to make the Associates full-time staff and (2) to make them full-time line. After much deliberation the Committee concluded that the latter, namely the line position, is preferred, primarily for the following reasons.

(1) The Director of Research position can then be an effective one by relieving it of the excessively heavy burden of directing and coordinating the work of 12 Divisions.

(2) The responsibility for planning and implementation is in the same group.

(3) Better men can be obtained, for many men will not accept a purely staff job.

(4) Coordination of work can be more easily effected.

(5) A straight-forward, single line of authority on all matters can be established.

As was pointed out in Sec. 2.3, the majority of the industrial laboratory directors stated these positions should be line.

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The Committee considered the number of line Associates desired from both management and program points of view and concluded that there should be three (as at present). Their primary scientific areas should be the fields of electronics, materials, and nucleonics. They should have the same detailed responsibilities as the Director of Research but restricted to their specific scientific areas and to overall policies and limitations prescribed by the Director of Research.

This move should not make the Associates "pure" administrators and take them too far from scientific work. Under the present system the Associates have two administrative responsibilities and these permit little, if any, time for scientific work. The proposed change, by removing some of the present administrative burdens, should enable the Associates to give more attention to scientific matters. This move may result in some increase in overhead but it is anticipated that it would not be very large or out of line with other laboratories of similar size.

The Committee recommends that

(1) the positions of Associate to the Director of Research be made line with the title changed to Associate Director of Research;

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(2) there be three such Associates and they have as their primary responsibility the fields of electronics, materials, and nucleonics;

(3) they have responsibility and concomitant authority within the areas assigned to them and within policies and limitations prescribed by the Director of Research over

(a) long range and broad overall research planning and programming;

(b) conduct of the overall research program;

(c) acceptance or rejection of new problems and modification of existing ones;

(d) budgeting;

(e) expenditures within the budget;

(f) promotion and hiring of personnel.

Division Organization

The duties and responsibilities of the Superintendents should remain essentially as they are at present. The Superintendents would be responsible to an Associate instead of to the Director of Research for programs in limited areas designated by the Associate Director of Research. This requires that the Superintendents have responsibility and concomitant authority within limited areas designated by the Associate Directors of

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Research and within overall policies and limitations prescribed by the Associate Directors of Research over

(1) long range research planning and programming;

(2) conducting the detailed research program;

(3) budgeting;

(4) expenditures within the budget;

(5) promotion and hiring of personnel.

To determine if organizational changes at the Division or Branch level should be made, the programs and organizations were carefully analyzed to see what changes might facilitate administration. It was recognized that any reorganization must take into account existing personnel and organizational units. Many schemes were proposed and analyzed. None turned out to be ideal, but modifications to bring together groups working on similar activities in applications research, solid state physics, radar, atmosphere and astronomy appeared very desirable. Bringing these similar activities together resulted in groups of sufficient size to warrant Division status. To determine if such Divisions should be recommended, consideration had, of course, to be given to the effect on existing Divisions and to the availability of qualified manpower for key positions. It was apparent that well qualified manpower was available within the Laboratory and that the establishment of new Divisions together with the full time Associate positions offered an opportunity to promote

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some of these scientists to top-level positions. The revision in Division and Branch structures resulting from this review are shown in Tables 4.5, 4.6, 4.7 and 4.8.

This reorganization is primarily a shifting of entire Branches. It was felt that such units should be the basic ones involved in any shift since they are generally capable of functioning effectively on their own wherever they might be located organizationally. There are a few instances where an existing Branch has been split but these are limited to cases where the work of the existing Branch is in more than one area. The Branch names are generally those presently in use but a few new ones have been suggested when it appeared desirable. An effort was made of course to keep Divisions of reasonable size and to distribute them equitably and logically in so far as possible under the three Associates.

Five Divisions are shown under the Associate for Electronics. The Electronics Division is built around the basic electronics work of the present Radio I Division. To this has been added the basic electronics work of the Avigation Branch of Radio III. This Division will therefore be primarily concerned with long-range electronic research and with development of radio components having broad application.

The Radio Division is based on the communications and countermeasure work of the present Radio II Division.

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The Electricity program now being carried on by the Electricity Division has been added since there is not enough of such work to warrant a Division by itself, and since it is more closely related to that of the Radio Division than to any other.

The Radar Division is formed by bringing together the Radar work of the present Radio II and Radio III Divisions.

The Sound Division remains unchanged except for the transfer of the psycophysics work to the Applications Research Division. The Sound Division is transferred to the Associate for Electronics because of the similarity of techniques and approaches to those of radar, and the common area of application of sonar, radio, and radar.

The Applications Research Division represents a new activity. Its purpose is to perform research on the integration of the Laboratory's developments so that they will be most effectively used by the fleet and to make studies to determine technical requirements for special fleet problems. It is staffed by personnel from the Psychology and Operational Research Branches of Radio III, the Systems Utilization Branch of Radio II, the Systems Division, and the Electronics Branch of the Sound Division (psychophysics group only), and includes Dr. Klein and his staff from the Office of the Director of Research.

There are four Divisions under the Associate for Materials. The Chemistry Division remains unchanged. The Mechanics Division is modified by the transfer from it of the

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Aerology Branch as mentioned below and by the addition of the computer work of the Operational Research Branch of Radio III to the Applied Mathematics Branch. The Metallurgy Division is now limited to metallurgical work; all solid state physics is transferred to a new Division, the Solid State Division. The Solid State Division is formed by bringing together the Operational Equipment, Cryogenics and Electromagnetics Branches of the Electricity Division; the Crystal Branch, the Electric and Magnetic Alloys Branch and the Luminescent Material Section of the Chemistry Branch of the Metallurgy Division; and the ferromagnetic work of the Special Research Branch of Radio I.

There are also four Divisions under the Associate for Nucleonics. These are the present Radiation, Nucleonics, and Optics Divisions which remain essentially as they now are. To these have been added a new Division, the Atmosphere and Astronomy Division. This Division is formed by bringing together the Aerology Branch of the Mechanics Division, the atmospheric electricity work of the Special Research Branch, the radio astronomy work of the R.F. Research Branch and the Rocket Sonde and Rocket Development Branches, all of Radio I.

The Committee recommends that

(1) the reorganization of the Divisional structure as shown in Tables 4.5, 4.6, 4.7 and 4.8 be adopted;

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(2) the Superintendents of the Divisions have responsibility and concomitant authority within their Divisions and within overall policies and limitations prescribed by the Associate Directors of Research over

(a) long range research planning and programming;

(b) conduct of the detailed research program;

(c) budgeting;

(d) expenditures within the budget;

(e) promotion and hiring of personnel.

4.5 LIAISON OFFICERS

The proposed reorganization, primarily the placing of the Associates in line, naturally raises questions about the functions of the Program Officers.

There is general agreement that the role of the Program Officers at the Laboratory should be solely that of liaison. They should assist the scientists in contacts with the fleet and Bureaus and in the development of devices for fleet use where their Naval experience would be beneficial. They should also act as staff to the Director and carry out any special assignment he may request. They should not influence the scientific program by determining or approving budget, priorities,

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or large equipment purchases, nor should they act as special lines of communication between the scientists and the Director.

The Committee recommends that

(1) the function of the present Program Officers be solely liaison and that they be designated as Liaison Officers;

(2) they serve as staff to the Director to carry out such special assignments as he may request;

(3) they make the necessary arrangements for outside military assistance;

(4) they assist the scientists in making contacts within the Department of Defense to aid in establishing research requirements, selling Naval Research Laboratory ideas, facilities, services, etc.

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TABLE 4.2

RESEARCH DEPARTMENT

PRESENT DIVISION AND BRANCH ORGANIZATION
UNDER STAFF COGNIZANCE OF THE
ASSOCIATE FOR ELECTRONICS
(September 1953)

	Number of Personnel	FY 54 Budget K$
RADIO I DIVISION	212	2970
Antenna Research		
R. F. Research		
Rocket Development Research		
Rocket Sonde Research		
Security Systems Research		
Special Research		
Vacuum Tube Research		
Wave Propagation Research		
RADIO II DIVISION	235	2490
Communications		
Countermeasures		
Radio Techniques		
Search Radar		
Systems Utilization		
RADIO III DIVISION	202	1840
Avigation		
Equipment Research		
Operational Research		
Psychology		
Radar I		
Radar II		
Special Research		
SYSTEMS DIVISION	18	165
Analysis and Methodology		
Military Applications		
TOTAL	667	7465

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TABLE 4.3

RESEARCH DEPARTMENT

PRESENT DIVISION AND BRANCH ORGANIZATION
UNDER STAFF COGNIZANCE OF THE
ASSOCIATE FOR MATERIALS
(September 1953)

	Number of Personnel	FY 54 Budget K$
CHEMISTRY DIVISION	139	1220
Electrochemistry		
Engineering Research		
Fuels		
High Polymers		
Physical and Organic		
Protective Chemistry		
Protective Coatings		
Surface Chemistry		
ELECTRICITY DIVISION	96	820
Airborne Systems		
Cryogenics		
Electromagnetics		
Operational Equipment		
Shipboard Systems		
MECHANICS DIVISION	101	1300
Aerology		
Applied Mathematics		
Ballistics		
Shock and Vibration		
Structures		
Thermodynamics		
METALLURGY DIVISION	103	970
Chemistry		
Corrosion		
Crystals		
Electric and Magnetic Alloys		
Ferrous Alloys		
High Temperature Alloys		
Metal Processing		
Non-Ferrous Alloys		
TOTAL	439	4310

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TABLE 4.4

RESEARCH DEPARTMENT

PRESENT DIVISION AND BRANCH ORGANIZATION
UNDER STAFF COGNIZANCE OF THE
ASSOCIATE FOR NUCLEONICS
(September 1953)

	Number of Personnel	FY 54 Budget K$
NUCLEONICS DIVISION	80	930
Accelerators		
Atomic Physics		
Heavy Particles		
Light Particles		
Special Instruments		
Theory		
OPTICS DIVISION	83	1020
Applied Optics		
Electron Optics		
Micron Waves		
Photometry		
Radiometry		
RADIATION DIVISION	83	1215
Analysis		
Measurements		
Particles		
Propagation		
Reactions		
Recording		
SOUND DIVISION	133	1855
Airborne Sonar		
Electronics		
Propagation		
Sonar Systems		
Transducers		
TOTAL	379	5020

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TABLE 4.5

RESEARCH DEPARTMENT

PROPOSED ORGANIZATION

Director of Research

Associate for Electronics	Associate for Materials	Associate for Nucleonics
Applications Research	Chemistry	Atmosphere & Astronomy
Electronics	Mechanics	Nucleonics
Radio	Metallurgy	Optics
Radar	Solid State	Radiation
Sound		

Program Records Office

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TABLE 4.6

RESEARCH DEPARTMENT

PROPOSED DIVISION AND BRANCH ORGANIZATION
under
ASSOCIATE FOR ELECTRONICS

	Number of Personnel	Annual Budget K$
APPLICATIONS RESEARCH DIVISION	112	1040
Data Processing		
Engineering Psychology		
Systems Analysis		
Operational Research		
ELECTRONICS DIVISION	141	1800
Antennas		
Avigation		
Propagation		
Security Systems		
Vacuum Tubes		
RADAR DIVISION	180	1600
High Resolution		
Radar Techniques		
Surveillance		
Tracking		
Weapons Control		
RADIO DIVISION	198	2100
Airborne Electrical		
Communications		
Countermeasures		
Radio Techniques		
Shipboard Electrical		
SOUND DIVISION	130	1760
Airborne Sonar		
Electronics		
Propagation		
Services		
Sonar Systems		
Transducers		
TOTAL	761	8300

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TABLE 4.7

RESEARCH DEPARTMENT

PROPOSED DIVISION AND BRANCH ORGANIZATION
under
ASSOCIATE FOR MATERIALS

	Number of Personnel	Annual Budget K$
CHEMISTRY DIVISION	141	1220
Electrochemistry		
Engineering Research		
Fuels		
High Polymers		
Personnel Protection		
Physical and Organic		
Protective Coatings		
Surface Chemistry		
MECHANICS DIVISION	96	1150
Applied Mathematics		
Ballistics		
Shock and Vibration		
Structures		
Thermodynamics		
METALLURGY DIVISION	64	700
Analytical Chemistry		
Corrosion		
Ferrous Alloys		
High Temperature Alloys		
Metal Processing		
Non Ferrous Alloys		
SOLID STATE DIVISION	103	900
Applications		
Cryogenics		
Crystals		
Ferromagnetics		
Luminescence		
Metal Physics		
Paramagnetics		
TOTAL	404	3970

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TABLE 4.8

RESEARCH DEPARTMENT

PROPOSED DIVISION AND BRANCH ORGANIZATION
under
ASSOCIATE FOR NUCLEONICS

	Number of Personnel	Annual Budget K$
ATMOSPHERE AND ASTRONOMY DIVISION	85	1510
Aerology		
Atmospheric Electricity		
Ballistic Missile		
Radio Astronomy		
Rocket Sonde		
NUCLEONICS DIVISION	81	930
Atomic Physics		
Cosmic Rays		
Nuclear Apparatus		
Nuclear Interactions		
Radioactivity		
Theory		
OPTICS DIVISION	83	1000
Applied Optics		
Electron Optics		
Micron-Waves		
Photometry		
Radiometry		
RADIATION DIVISION	83	1220
Analysis and Theory		
Nuclear Instrumentation		
Nuclear Reactions		
Nuclear Systems		
Radiation Effects		
Reactors		
TOTAL	332	4760

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CHAPTER 5

PROCEDURES

5.1 INTRODUCTION

General procedures should be simple and flexible and at the same time maintain proper management control. They must be based on in-line responsibility. The responsibilities, which have been set forth in Chapter 4, must be considered firm whereas the procedures suggested here represent a possible mechanics for carrying out these responsibilities. The responsible individual must set up and, from time to time, adjust the procedures so that they are consistent with carrying out the designated responsibility.

The Committee recommends that the procedures set forth in Secs. 5.2 through 5.9 be adopted.

5.2 SCIENTIFIC PROGRAM

(1) The Director of Research and his staff will periodically (at least annually) review the long range program aims of the Laboratory.

(2) The Director of Research and his staff will continually review the existing scientific program and formulate plans to keep the program in line with the long range aims.

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(3) The Director of Research will, upon proper review by his staff, officially initiate, accept or reject problems for the Laboratory. (Wherever possible, problems should be set up or combined so that they involve at least an annual expenditure of $10,000.)

5.3 BUDGET

In the budget considerations which follow, all budgeting areas - direct, indirect, plant account, public works - are included at all points unless specific exception is made.

(1) The Director will determine the total funds estimated to be available for the subsequent year and what fraction of the total is to be allocated to the Department of Research and the Department of Administration. (This determination can be made with the advice and consultation of the Administrative Advisory Committee - see Sec. 6.2.)

(2) The Departmental Directors will request budget estimates from the Divisions, setting forth guide lines which are in accordance with Program Plans determined by the Departmental Director and his staff. The Comptroller's Office will assist in the preparation of forms and other budget presentation details.

(3) The Divisions will prepare budget estimates with the assistance of the Departmental Staff and the Comptroller's Office.

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(4) The Comptroller will prepare for the Departmental Directors such summary data of the Division estimates as may be required.

(5) The Departmental Director and his staff will review the overall Departmental budget and make such adjustments as are necessary to bring the budget in line with the planned program and the total estimated funds available. The Comptroller will provide such assistance in this review as may be required.

(6) The Departmental Directors and/or their staffs will engage in joint discussions and arrive at detailed agreement concerning common budgeting areas including Public Works, Engineering Shops and other services.

(7) Upon approval and completion of the Departmental budget, the Departmental Director will submit the budget to the Director for overall review. (This review can be made with the advice and consultation of the Administrative Advisory Committee.)

(8) Subsequent changes in the budget can be made by the Departmental Director if there is no significant change in the total Departmental budget. All significant changes in the Departmental total budget require approval by the Director.

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5.4 PROCUREMENT

The following procedures apply to all procurements including materials and services procured outside of, or within, the Laboratory. This involves those services of the Engineering Services, Public Works and other Administrative Divisions for which charges are made, as well as all such services within the Research Department (e.g., computer time, analysis services, etc.) Obtaining the estimated cost is in all cases the responsibility of the Division Superintendent requesting the services. If no accurate figures are available, such determination will have to be done on a "best guess" basis.

Department of Research

(1) Final approval for the procurement of equipment, materials, or services which have been budgeted, the estimated cost of which is not in excess of $1,000, will be given by the Division Superintendent.

(2) Final approval for the procurement of equipment, materials, or services which have been budgeted, the estimated cost of which is in excess of $1,000 but less than $5,000 will be given by the appropriate Associate Director of Research after approval by the Division Superintendent.

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(3) Final approval for the procurement of equipment, materials, or services which have been budgeted, the estimated cost of which is in excess of $5,000 will be given by the Director of Research after approval by the Division Superintendent and the appropriate Associate Director of Research.

(4) Final approval for the procurement of equipment, materials, or services which exceed the Division budget, the estimated cost of which is less than $5,000, will be given by the appropriate Associate Director of Research after approval by the Division Superintendent; if greater than $5,000, by the Director of Research after approval by the Division Superintendent and the appropriate Associate Director of Research.

(5) The Director of Research will bring to the attention of the Director such procurement items for information or approval as he deems necessary.

Department of Administration

(1) Final approval for the procurement of equipment, materials, or services which have been budgeted, the estimated cost of which is not in excess of $1,000, will be given by the head of the Division.

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(2) Final approval for the procurement of equipment, materials, or services which have been budgeted, the estimated cost of which is in excess of $1,000 will be given by the Director of Administration after approval by the head of the Division.

(3) Final approval for the procurement of equipment, materials, or services which exceed the Division budget will be given by the Director of Administration after approval by the head of the Division.

(4) The Director of Administration will bring to the attention of the Director such procurement items for information or approval as he deems nesessary.

5.5 PERSONNEL

(1) The Director will assign, at least semi-annually, specific personnel ceilings to the Departments. These ceilings will be based on the program, the budget, and Navy Department personnel policies.

(2) All new hiring and all inter-Divisional transfers will require review and approval by the Departmental Director and/or his staff. Assuming appropriate certification by the Civil Service Commission,

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approval by the Departmental Director constitutes authority for the Personnel Division to proceed with hiring. The Departmental Director will periodically advise the Director of general personnel activities.

(3) Selection of personnel for hiring, promotion and separation will be an in-line function. Consideration at higher level will involve approval or veto and not selection. After approval, the Personnel Division will take the appropriate action in accordance with existing Civil Service regulations.

(4) High level promotions (into GS-12 and above) will be reviewed and approved by the Departmental Director and his staff prior to any personnel action.

(5) The Personnel Division will furnish the Departments such assistance and staff service on personnel matters as may be requested by the Departmental Director.

5.6 CORRESPONDENCE

(1) The routing of all outgoing correspondence will be from the originator in-line to the person designated responsibility to sign. The latter will see that information copies are routed to interested parties.

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(2) The Director will sign all correspondence which makes broad commitments on behalf of the Laboratory and certain other kinds of correspondence, such as replies to members of Congress, resplies to Departmental Secretaries, etc.

(3) The Director of Research, the Associate Directors of Research, and Division Superintendents will sign official correspondence

(a) involving minor commitments or minor changes in existing commitments;

(b) dealing with scientific work of the Laboratory.

(The division of authority between the Director of Research, the Associate Directors of Research and Division Superintendents with respect to signing of correspondence will have to be worked out on the basis of experience. Until such experience has been obtained, most of this type of correspondence should be signed by the Director of Research or the Associate Directors of Research with a gradual transition towards having the Division Superintendents sign certain categories of correspondence.)

(4) The signing of administrative correspondence will be in accordance with existing procedures[18].

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(5) The signing of correspondence concerning items of technical information, committee work, etc., will be in accordance with existing procedures[18].

(6) The Director of Research will establish policy regarding the routing of incoming correspondence within the Research Department. (The existing mechanics of routing by the Liaison Officers should be continued. In establishing incoming routing policies and mechanics, every effort must be made to get the correspondence first to the scientist most concerned followed later by information routing.)

(7) Liaison Officers will sign

(a) official correspondence relating to arrangements for military service facilities, military tests, etc.

(b) such other correspondence as directed by the Director.

5.7 TECHNICAL REPORTS, ETC.

(1) Approval for the issuance of all formal technical reports and for the presentation of all technical talks or lectures will be given by the appropriate Associate Director of Research and/or the Director of Research who will screen them for both technical

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content and proper security classification. After such approval the reports and talks will be screened by the Administrative Department for patent review, for appropriate recording by the Technical Information Division, and for final security review.

(2) The Director of Research will be responsible for coordinating the various scientific seminars conducted within the Naval Research Laboratory.

5.8 MILITARY ASSISTANCE

(1) Division Superintendents will keep the Associate Director of Research and the Liaison Officer advised of forthcoming requirements for military assistance. Requests for military services and tests will be made of the Liaison Officer via the Associate Director of Research.

(2) The Liaison Officer will take the necessary formal action to obtain the required services.

(3) The Liaison Officers will keep themselves informed on the Laboratory participation in military operations in the field and where desirable will accompany the engineers and scientists.

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5.9 PRIORITIES

(1) The Director of Research and his staff will establish priorities for Research Department work in the Public Works Division. He and his staff will collaborate with the Director of Administration to establish periodically an overall Public Works Priority List.

(2) The Director of Research and his staff will establish priorities for Research Department work in the Engineering Services Division.

(3) The Director of Research and his staff will establish priorities for Research Department work in the Technical Information Division and other Administrative Divisions.

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CHAPTER 6

COMMITTEES

6.1 INTRODUCTION

At present there are both overall Laboratory and Departmental committees.[19,20] It is felt that the committee setup should be clarified by having each committee report to an appropriate individual responsible for its membership and duties. Although suggestions are made below, it should be emphasized that it is the perogative of the Director of the Laboratory or the Departmental Director to establish or disestablish any committee.

The listing of committees which follows is generally in keeping with the existing committee plan[19,20]. The function and membership are listed only if they depart from the present ones. The membership suggested is in keeping with the organizational changes proposed in Chapter 4.

The Committee recommends that

(1) overall Laboratory committees report to the Director;

(2) Research Department Committees report to the Director of Research;

(3) Administrative Department Committees report to the Director of Administration;

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(4) the committee function and membership be the responsibility of the Director to which the committee reports;

(5) initially the committees, their functions and membership be as given in Secs. 6.2 through 6.4.

6.2 OVERALL LABORATORY COMMITTEES REPORTING TO THE DIRECTOR

Administrative Advisory Committee

Director's Council

6.3 RESEARCH DEPARTMENT COMMITTEES REPORTING TO THE DIRECTOR OF RESEARCH

Research Advisory Committee

Function

The Research Advisory Committee advises the Director of Research on the scientific program and on the administration of the Research Department. It assists within the Research Department in planning the long-range scientific program, coordinating the scientific work, reviewing the budget, accepting or modifying problems, considering personnel actions, and initiating such studies as may be necessary or desirable.

Membership

Director of Research, Chairman

Associate Directors of Research

Isn't this redundant? These functions are already dealt by those of Res. Dir. + his associates.

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Research Director's Council

Function

The Research Director's Council serves as an information medium and advises the Director of Research on matters of interest to the Research Department.

Membership

Director of Research, Chairman

Associate Directors of Research

Superintendents of Scientific Divisions

(This Committee replaces the Scientific Program Board. The Committee feels strongly that there should be an advisory body of the Superintendents to provide a forum for the discussion of technical and administrative matters.)

Library Committee

Function

The Library Committee advises the Director of Research on matters relating to the Library, informs him of general needs of the scientific Divisions, suggests possible distribution of funds allocated to the Library, and advises on the kinds and numbers of new acquisitions to be made by the Library. The Director of Research advises the Technical Information Officer concerning the above items.

→ Same membership as SPB. Does SPB cease to act? Outcome or rejection of problems?

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Membership

One member from each scientific Division

Librarian (ex-officio - non-voting)

Scientific Awards Panel

See Sec. 6.5.

Scientific Advisory Committees

Function

The Scientific Advisory Committees are concerned with exchanging information and providing the Director of Research with scientific advice in specified areas. No specific committees are recommended at this time. The Director of Research or his staff should set up such committees when deemed necessary or advisable.

6.4 ADMINISTRATIVE DEPARTMENT COMMITTEES REPORTING TO THE DIRECTOR OF ADMINISTRATION

The remainder of the Committees in the Naval Research Laboratory listing[19,20] should report to the Director of Administration. The only changes suggested are as follows.

Administrative Awards Panel

A new awards procedure is recommended and discussed in Sec. 6.5.

Radiological Safety Committee

This Committee should be reconstituted to have representation from all Divisions concerned with radioactive materials.

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6.5 AWARDS COMMITTEE

The Committee feels that the present procedure for handling awards is inadequate for the following reasons.

(1) The Scientific Divisions feel that the price in red tape and justification is too high to warrant award recommendations.

(2) Consideration of both administrative and scientific awards by a single committee fails to place the emphasis on scientific awards appropriate to a scientific laboratory.

(3) The fact that the Committee membership is at the Branch Head and lower level makes it difficult to consider awards at higher scientific levels.

The Committee recommends that

(1) The Administrative Advisory Committee be constituted as the Awards Board; that it consider recommendations for awards brought to it by a Scientific Awards Panel and an Administrative Awards Panel; that it consider directly award recommendations for top level personnel;

(2) a Scientific Awards Panel of the Board be established, consisting of the Director of Research and the Associate Directors of Research, to consider recommendations for both honorary and monetary awards

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based on scientific accomplishments; a sub-panel be established for preliminary screening of recommendations for scientific awards to lower level personnel;

(3) an Administrative Awards Panel of the Board be established, consisting of the Director of Administration, the Comptroller, the Management Engineer, and the Personnel Officer to consider recommendations for both honorary and monetary awards for non-scientific accomplishments. In addition this panel should review and make recommendations on beneficial suggestions. A sub-panel should be established to consider recommendations for lower level administrative awards.

6.6 OUTSIDE ADVISORY COMMITTEE

Several of the large government laboratories have or have had advisory committees composed of top level scientists from universities and industry. The advisability of such a committee for the Naval Research Laboratory was discussed with several people who had experience with them; they generally agreed that such committees are beneficial. Since the Naval Research Advisory Committee serves this function for the Office of Naval Research, the Committee feels that it would be desirable for this same Committee also to serve the Laboratory.

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The Committee recommends that the Office of Naval Research be requested to ask the Naval Research Advisory Committee to act also as the advisory committee to the Laboratory.

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CHAPTER 7

MISCELLANEOUS

7.1 CHESAPEAKE BAY ANNEX

The Laboratory's Chesapeake Bay Annex field station was established during the war primarily for the purpose of providing an over-water testing site for radar. In this connection it proved exceedingly useful for work on both search and fire control radar. In addition, it was also used for various radio communication testing purposes.

The Chesapeake Bay Annex has a large accumulation of radar and radio facilities which is unique in this country. In addition various non-radio facilities have been added since the war, principally in the fields of optics, aerology, and thermodynamics. Today its use is confined principally to four scientific Divisions; Radio II, Radio III, Optics, and Mechanics Divisions, the first two being the major users.

The budget for maintenance and operation for FY 1954 is approximately $350,000. (The cost of maintaining the civilian guard services alone is approximately $50,000 a year.) This does not include the direct cost of research. The maintenance and operation cost is charged to the Naval Research Laboratory administrative overhead and represents about 5% of the total

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overhead. Since the facility is utilized primarily by only two of the 12 scientific Divisions, it seems inappropriate to charge all of the maintenance and operation of the Annex to general Laboratory overhead.

Various building and public works projects totaling about 2½ million dollars are now nearing completion at the Annex. When these new facilities are put to use, the cost of operating the station will increase by anywhere from 25 to 50%. (As of January 1954 the cost has already increased approximately 10%.) This expansion was made in part to provide facilities which would support major program expansion under mobilization conditions. In addition, the present Naval Research Laboratory mobilization plans establish the Annex as an alternate headquarters in the event that the present Laboratory site be rendered inactive.

The Committee recommends that

(1) the Chesapeake Bay Annex be retained as an operating field station;

(2) the cost of operating the Chesapeake Bay Annex, with the exception noted under (3) below, be charged directly to the problems involved on some equitable basis, such as a percentage of the direct labor working on that problem at the Annex;

(3) a portion of the cost of the Chesapeake Bay Annex operation, roughly that of maintaining it in a

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caretaker's status, be borne by the overall Naval Research Laboratory overhead. (An analysis of recent financial reports on the Annex indicates that this portion would be somewhere between 10 and 20% of the Annex operating cost.)

7.2 RELATIONS WITH THE BUREAUS, OFFICE OF NAVAL RESEARCH AND OTHER LABORATORIES

The findings reported in Sec. 2.5 regarding contacts with outside activities indicate the need for improved relations in certain areas.

The Committee recommends that the Director of Research, the Associate Directors of Research, the Scientific Division Superintendents, and the Liaison Officers continually make an effort to bring about closer working relationships with the Bureaus, Office of Naval Research, and other research laboratories.

7.3 DIVISION OVERHEAD

The Naval Industrial Fund accounting system involves two types of overhead; one a Division overhead charged to the Division problems, and the other a Laboratory overhead charged uniformly to all problems. Currently the Division overhead charges vary among the Divisions by a factor of four. This is

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partly the result of each Division making its own interpretation of a "direct" or an "indirect" service; for example, in some Divisions all Branch Heads are charged to indirect while in other Divisions many are charged to direct cost.

The Committee recommends that a uniform practice be set up for determining Division overhead.

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CHAPTER 8

SUMMARY OF RECOMMENDATIONS

CHAPTER 3 PROGRAM

3.5 PROPOSED DISTRIBUTION OF EFFORT

BY CHARACTER OF WORK

The Committee recommends that there be a gradual shift of emphasis so that basic, supporting, and applied research be at least two-thirds of the Laboratory's total effort.

BY MAJOR PROGRAM AREA

NUCLEAR

The Committee recommends that

(1) the effort in nuclear work including all work pertaining to nuclear end products be increased to about one-fourth of the Laboratory's total effort in FY 1957;

(2) the greatest portion of the increase in nuclear work be in the field of nuclear power, including a greater emphasis on materials for power systems. The aim should be to produce an approximately equal effort in power and weapons.

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BY MAJOR PROGRAM AREA (continued)

RADIO

The Committee recommends that

(1) the effort in radio work, including all work pertaining to radio end products, be decreased by about 15% of the present radio program;

(2) the ballistic missile program be stopped as soon as feasible and in no case later than FY 1957;

(3) there be a reduction in development work;

(4) there be a combining of closely related work now current in different Divisions;

(5) there be an increase in research on vacuum tubes and similar devices;

(6) the total amount of applications research be continued at approximately its present level; a moderate program in operational research be established.

SOUND

The Committee recommends that

(1) the total effort in Sound be continued at approximately its present level;

(2) the program be reoriented to provide greater emphasis on supporting and applied research and less on development.

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BY MAJOR PROGRAM AREAS (continued)

MATERIALS

The Committee recommends that

(1) there be an increase in work on materials for nuclear power application;

(2) the remainder of the Materials program continue at about its present level.

MISCELLANEOUS

The Committee recommends that

(1) the Upper Atmosphere program be continued at approximately its present level of personnel participation and that the total cost of the program, including that of rockets and expendable equipment, be limited to 10% of the total Laboratory direct cost RN budget;

(2) the remainder of the Miscellaneous programs be continued at approximately their present level.

3.6 PROPOSED PROGRAM DISTRIBUTION IN CASE OF INCREASE OR DECREASE

25% INCREASE

The Committee recommends that

(1) the greatest portion of the increase be in the scientific areas;

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25% INCREASE (continued)

(2) the distribution of effort among the scientific programs be approximately the same as that recommended in Sec. 3.5 for the present operating level.

25% DECREASE

The Committee recommends that

(1) about two-thirds of the decrease be made in the service areas;

(2) the ballistic missile program be dropped immediately;

(3) the remainder, about 15%, be applied uniformly to the research programs such that the aims for the relative distribution of effort among the scientific programs be approximately the same as that recommended in Sec. 3.5 for the present operating level.

3.7 PROGRAM SUPPORT

The Committee recommends that

(1) the approximate equality between Office of Naval Research support and non-Office of Naval Research support be continued;

(2) no group at the Naval Research Laboratory, should over a long period of time, become the satellite of any outside organization.

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CHAPTER 4 ORGANIZATION

4.2 OVERALL LABORATORY ORGANIZATION

The Committee recommends that

(1) the present top organizational structure consisting of a Director of Research and a Director of Administration, both reporting to the Director, be retained;

(2) the Department of Administration retain all service functions it now performs.

4.4 PROPOSED RESEARCH DEPARTMENT ORGANIZATION

DIRECTOR OF RESEARCH

The Committee recommends that the Director of Research have responsibility and concomitant authority within overall policies and limitations set by the Director over

(1) long range and broad overall research planning and programming;

(2) conduct of the overall research program;

(3) acceptance or rejection of new problems and modification of existing ones;

(4) Research Department budgeting;

(5) Research Department expenditures within the budget;

(6) promotion and hiring of Research Department personnel.

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ASSOCIATE DIRECTORS OF RESEARCH

The Committee recommends that

(1) the positions of Associate to the Director of Research be made line with the title changed to Associate Director of Research;

(2) there be three such Associates and they have as their primary responsibility the fields of electronics, materials, and nucleonics;

(3) they have responsibility and concomitant authority within the areas assigned to them and within policies and limitations prescribed by the Director of Research over

(a) long range and broad overall research planning and programming;

(b) conduct of the overall research program;

(c) acceptance or rejection of new problems and modification of existing ones;

(d) budgeting;

(e) expenditures within the budget;

(f) promotion and hiring of personnel.

DIVISION ORGANIZATION

The Committee recommends that

(1) the reorganization of the Divisional structure as shown in Tables 4.5, 4.6, 4.7, and 4.8 be adopted;

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DIVISION ORGANIZATION (continued)

(2) the Superintendents of the Divisions have responsibility and concomitant authority within their Divisions and within overall policies and limitations prescribed by the Associate Directors of Research over

(a) long range research planning and programming;

(b) conduct of the detailed research program;

(c) budgeting;

(d) expenditures within the budget;

(e) promotion and hiring of personnel.

4.5 LIAISON OFFICERS

The Committee recommends that

(1) the function of the present Program Officers be solely liaison and that they be designated as Liaison Officers;

(2) they serve as staff to the Director to carry out such special assignments as he may request;

(3) they make the necessary arrangements for outside military assistance;

(4) they assist the scientists in making contacts within the Department of Defense to aid in establishing research requirements, selling Naval Research Laboratory ideas, facilities, services, etc.

How well liaison officers kept informed about the programs + problems in the research divisions - or aren't they supposed to know?

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CHAPTER 5 PROCEDURES

The Committee recommends that the procedures set forth in Secs. 5.2 through 5.9 be adopted.

CHAPTER 6 COMMITTEES

The Committee recommends that

(1) overall Laboratory committees report to the Director;

(2) Research Department Committees report to the Director of Research;

(3) Administrative Department Committees report to the Director of Administration;

(4) the committee function and membership be the responsibility of the Director to which the committee reports;

(5) initially the committees, their functions and membership be as given in Secs. 6.2 through 6.4.

6.5 AWARDS COMMITTEE

The Committee recommends that

(1) the Administrative Advisory Committee be constituted as the Awards Board; that it consider recommendations for awards brought to it by a Scientific Awards Panel and an Administrative Awards Panel; that it consider directly award recommendations for top level personnel;

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6.5 AWARDS COMMITTEE (continued)

(2) a Scientific Awards Panel of the Board be established, consisting of the Director of Research and the Associate Directors of Research, to consider recommendations for both honorary and monetary awards based on scientific accomplishments; a sub-panel be established for preliminary screening of recommendations for scientific awards to lower level personnel;

(3) an Administrative Awards Panel of the Board be established, consisting of the Director of Administration, the Comptroller, the Management Engineer, and the Personnel Officer to consider recommendations for both honorary and monetary awards for non-scientific accomplishments. In addition this panel should review and make recommendations on beneficial suggestions. A sub-panel should be established to consider recommendations for lower level administrative awards.

6.6 OUTSIDE ADVISORY COMMITTEE

The Committee recommends that the Office of Naval Research be requested to ask the Naval Research Advisory Committee to act also as the advisory committee to the Laboratory.

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CHAPTER 7 MISCELLANEOUS

7.1 CHESAPEAKE BAY ANNEX

The Committee recommends that

(1) the Chesapeake Bay Annex be retained as an operating field station;

(2) the cost of operating the Chesapeake Bay Annex, with the exception noted under (3) below, be charged directly to the problems involved on some equitable basis, such as a percentage of the direct labor working on that problem at the Annex;

(3) a portion of the cost of the Chesapeake Bay Annex operation, roughly that of maintaining it in a caretaker's status, be borne by the overall Naval Research Laboratory overhead.

7.2 RELATIONS WITH THE BUREAUS, OFFICE OF NAVAL RESEARCH AND OTHER LABORATORIES

The Committee recommends that the Director of Research, the Associate Directors of Research, the Scientific Division Superintendents, and the Liaison Officers continually make an effort to bring about closer working relationships with the Bureaus, the Office of Naval Research, and other research laboratories.

7.3 DIVISION OVERHEAD

The Committee recommends that a uniform practice be set up for determining Division overhead.

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