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LETTER TO ALL STAFF

THE ROLE OF NRC IN CANADIAN SCIENCE AND ENGINEERING:
A REDEFINED POLICY FRAMEWORK

The Council and Executive of the National Research Council in consultation with our Minister, have recently redefined NRC's overall role in scientific and engineering research. The aim has been to provide a broad policy framework which takes into account present realities and changing national needs, and which will enable NRC to discharge its future responsibilities more effectively. I wish to inform you of these deliberations and to set out in this letter the redefined policy framework and research program of NRC.

Background

The role of NRC within the overall Canadian research and development effort has been unique, and throughout the Council's long history this role has evolved continuously in response to new needs or opportunities. As an independent research agency with its own governing body, NRC was encouraged to develop a strong Canadian R & D capability and high quality scientific expertise available to governments, to the private sector, and to Canadian citizens.

In 1966, the National Research Council celebrated the completion of its first half-century of service to Canada. Although some new challenges requiring new responses were already evident at that time, I think we all shared a profound sense of accomplishment and pride in the respect that NRC had achieved in Canada and throughout the world.

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We had built a group of laboratories with excellent and highly motivated research staffs second to none in Canada and we were on the eve of our first Nobel award. Through NRC leadership and support, university laboratories had developed strength in most scientific disciplines to the point where it was no longer necessary for Canadian students to seek high quality scientific training outside Canada. NRC had made substantial progress in assisting industrial research and development, although our industrial development was somewhat retarded for reasons that are well known and largely unrelated to science and technology. Canadian science and technology had reached a certain degree of maturity and of R & D capability where they could henceforth contribute more effectively to our national development.

The NRC has been well aware that some changes in national policies for science and technology were required to deal with the changing circumstances and needs. During the past six years NRC has modified its policies and programs within its mandate to be able to respond positively to new priority needs of the country on the one hand, and to adapt to static or declining budgets on the other. However further and more fundamental changes are now required.

In recent years it has been national policy to restrict growth of R & D activity in the government and in the university sectors and to accord higher priority to industrial R & D. The announced 'contracting-out' (make or buy) principle is a specific action in line with this policy. It is probable that these general policy directions will be continued for some time into the future. Additionally, a number of long-term problem areas are now of growing national concern and will clearly require expanded R & D effort.

Early this year the government announced its decision to separate the University Grants and Scholarships Program from NRC and to set up a new granting Council to take over this function. In the past, NRC has from time to time 'spun off' major activities it had developed, e.g. AECL, DRB, MRC. However, the separation of the university grants function, which had been one of the cornerstones of NRC's broader science role in Canada, represents a more fundamental change. The present situation demands less emphasis on the general development of science and more emphasis on effective ways of using the demonstrated capability of NRC for our national development. In the future, NRC activities will be largely centered around its laboratory programs and such extra-mural programs as may be undertaken will be closely coupled so as to support or extend laboratory programs.

Redefined NRC Role and Policies

Although NRC's principal function is research in science and engineering, its specific research activities must nevertheless be well focussed and its overall role must be clearly defined within the total Canadian scientific research and development effort. As a guiding principle, NRC must build on its existing strengths and capabilities; it should concentrate on those things it can do best and on those things which are deemed highly important from a national standpoint but which, for various reasons, cannot be done by other agencies.

The following activities will form the basis of NRC's future research program:

- * basic and exploratory research;
- * long-term research, including selected areas of advanced technology and research directed toward problems of ongoing national concern;
- * industrially-oriented research and research services to industry;
- * research to provide technological support of social objectives;
- * specialized major research facilities developed and operated as national facilities;
- * physical measurements and standards.

The following specific policies relate to the above activities:

- * In order to maintain its scientific and engineering competence and close contact with the advancing scientific frontier, NRC will continue to perform basic and exploratory research for the creation and application of new knowledge. The level of this effort will constitute from one-quarter to one-third of NRC operations.
- * NRC will place emphasis on research in selected areas of advanced technology of high promise and on research related to long-term problems of national concern, such as energy, food, building and construction, and transportation.

- * NRC's industrial research and development role will continue to complement and reinforce R & D in Canadian industry by the development and transfer of technology and by direct assistance to R & D projects in industry.
- * Within its competence, NRC will continue to provide research support toward social objectives such as public safety and security, protection of property, health, and environmental quality.
- * NRC will continue to establish and manage major scientific and technical facilities that serve a variety of users.

NRC will provide a national reference center for standards of measurement and performance standards.

Because of NRC's non-regulatory nature and independence as a research agency with broad scientific expertise, it is frequently called upon for consultation or to undertake investigations on specific matters. In some cases this amounts to a kind of 'scientific ombudsman' task. Accordingly:

- * NRC recognizes an obligation to provide, within its competence, independent investigation of scientific and technical issues that are in the national interest.

In addition to the primary role of NRC set out above, its research activities will necessarily interface with, and complement, those of other government laboratories, industries and universities. In order to clarify these interrelations, the following policy statements have been adopted:

(i) Relations with Government Departments and Agencies

Federal government departments with no laboratories of their own, or other departments with R & D programs specialized to a particular mission, frequently require assistance in areas in which NRC has expertise or facilities. In addition to continuing to supply such assistance, NRC also has a continuing responsibility to do work of importance to Canada which does not fall within existing departmental missions or which broadly encompasses a number of missions. The following specific policy statements have been adopted:

- * In selected *program* areas, either through the NRC mandate or by specific agreement with government departments and agencies, R & D activities to be initiated by NRC may be directly related with the programs of federal departments and generally will constitute the exploratory research component of an integrated federal program.
- * NRC will continue to engage in co-operative Research and Development at the *project* level with researchers in individual government departments and agencies.
- * Within its capabilities, NRC will continue to respond positively to requests from federal departments and agencies for service from its unique facilities.
- * NRC provides scientific and engineering advice, as appropriate, in support of other federal departmental programs when the required expert knowledge resides within NRC. As an independent agency, NRC will not accept responsibility for regulatory action of government departments and agencies.

(ii) Relations with Industry

Within its capabilities NRC meets the research needs of industry in Canada through the research of its laboratories, staff consultations, information services, project grants or contracts, and other forms of assistance. NRC will try to complement and assist research in industry and will encourage, where feasible, R & D projects to be carried out in industry.

New emphasis will be given to a closer coupling of NRC laboratory research and industrial R & D in selected projects through a phased reorientation of the current Industrial Research Assistance Program (IRAP). This will involve increased NRC initiatives rather than merely relying on company submissions. Project proposals developed by NRC laboratories for work to be carried out in industry will compete freely for IRAP assistance with proposals from industry.

These and other approaches are directed toward a more effective transfer of technology from NRC laboratories to industry. Specifically:

- * NRC will develop from existing and future resources (including IRAP and NRCL) a program specifically directed to enhancing applied research and technological development and its transfer into industry. This involves the formation of joint NRC/Industry teams to work on selected projects which may be initiated by either industry or NRC. In either case the responsible involvement of NRC must be established and funding will be subject to negotiated agreement. It is envisaged that over the course of the next few years most of the program funds should be spent on selected projects of major significance.
- * NRC work on a proposed industrial technology, if it continued to be promising, would be pursued to a point where a competent company or group of companies could see its value and was prepared to take over final development and application. Bringing a company or companies to this point will usually require that they participate in the research so as to become knowledgeable. Assignment to a company will depend upon the company's overall capability and on the credibility of its plans and intentions regarding exploitation.
- * NRC continues, although in future on a more selective basis, various programs which in co-operation with resources available in the university sector (a) assist in the creation and strengthening of R & D teams in industry, (b) introduce higher-calibre scientists into Canadian industry and (c) promote exchanges whereby industry scientists gain training and experience for a period in universities or NRC laboratories.
- * NRC will provide scientific and engineering advice and assistance in solving technological problems, as appropriate, in support of Canadian industry when the required expert knowledge resides within NRC.

(iii) Relations with universities

To maximize the utilization of scientific and engineering research capability in Canadian universities which NRC has fostered over the years, it is desirable that strong interaction continue between NRC, industry, and the universities. Therefore, NRC wishes to assure the development of strong co-operative interfaces with the new university granting council.

- * In fields of research where NRC has identified the possibility of significant advances in fundamental techniques, maximum collaboration will be sought from university researchers.
- * NRC will continue to participate in co-operative and collaborative research programs with Canadian universities (through agreements or contracts) when the results of such research are considered to be a contribution to national Research and Development programs in which NRC has an identified responsibility.
- * NRC will continue to encourage the interchange of scientific and engineering personnel between NRC and university laboratories.

(iv) Relations with Provincial Research Institutions

Since a number of provincial Research Councils and Foundations have objectives somewhat similar to NRC's national role, NRC's activities should, where possible, be related to those of provincial institutions in a series mode rather than in parallel.

- * It is considered desirable to have engineering and scientific R & D resources locally or regionally accessible to the need for such resources. It is therefore NRC policy to regard provincial institutions as having prior responsibility for the satisfaction of provincial needs within their capability. NRC will respond to requests that can not be thus satisfied.
- * NRC will be prepared to engage more actively in co-operative R & D with provincial agencies when the unique capabilities of both should be jointly employed to further a national R & D purpose.

NRC Objectives and NRC Programs

The attached Appendices contain summaries of NRC objectives and program descriptions. These have been prepared for budgetary estimates. The same program format, with additional sub-division, will also be adopted for internal administrative purposes. Three separate NRC programs (in the Treasury Board sense) have been defined, and each will have a separate parliamentary vote:

A) Scientific and Engineering Research Program
(APPENDIX A)

It will be noted that this program has been broken down into the six major activities (discussed above) plus administrative services.

B) Scholarships and Grants in Aid of Research Program
(APPENDIX B)

This program will continue to be administered by NRC until the proposed Natural Sciences Research Council is set up, at which point it will be transferred to the new Council.

C) Scientific and Technical Information Program
(APPENDIX C)

This program will have a separate parliamentary vote and will not compete directly for resources with Program A.

Organization and Program Implementation

In order to carry out NRC's redefined role, as well as to improve upon several existing arrangements, I have recommended to our Minister, The Honourable C.M. Drury, and Council that we adopt a new management and organizational structure. This has been accepted and is now being implemented.

The rationale for these changes was based on the following considerations:

- (i) the need to achieve a better two-way communication between the laboratories and our governing Council;
- (ii) the desire to reduce the number of standing committees of Council, including Divisional Advisory Boards;
- (iii) the necessity to provide for greater participation and input by laboratory directors and laboratory research personnel in management decisions and planning of NRC activities;
- (iv) the increasing need to undertake major research projects requiring interdisciplinary or interdivisional co-operation.

The form of organization adopted, which is shown schematically in Appendix D, is based in part on a 'matrix' type of management. It involves the mutual interaction of two components: an hierarchical or vertical structure as displayed in the organization chart, coupled with horizontal co-operative projects involving joint participation by a number of laboratories. The focus and co-ordinating center for these two structures is the Management Committee composed of the President, Vice-Presidents, and Group Directors (Laboratories).

The role of Group Directors is to represent the laboratories on the Management Committee, to which they are appointed by Council for a specified term. Each Group Director will be chosen from a related group of laboratories, namely: Engineering Laboratories, Physical/Chemical Science Laboratories, and Biological Science Laboratories. In discharging his responsibilities on the Management Committee, each Group Director will work in close consultation with Directors in the same group.

While the new organizational structure may at first sight appear somewhat complex, I am convinced it is an evolutionary step in the right direction, and of course it can be modified in the light of experience.

The Management Committee will function as a bridge between the research staff and our governing Council. It will formulate policies for Council's consideration and be responsible for implementing agreed policies and program activities. It will give consideration to research proposals originating either from the laboratories or externally and arrange for their evaluation or further development. We are prepared to make additional resources available, if necessary, for feasibility studies and consulting services to assist the development of promising ideas and concepts.

This also touches on the question of planning and priority setting, matters which now assume much greater importance with near-static budgets. In the past we have experimented with some planning and analysis studies separate from or loosely related to research operations. These have been only partially successful and we are now convinced such studies must become an integral part of research operations themselves. In other words, those who will be responsible for implementing research programs must also be involved in the planning process from the outset. Policy planning (or strategic planning) is the responsibility of the executive of NRC and of our Council, who can call upon whatever assistance they require from NRC staff. On the other hand, program planning (or tactical

planning) must be a collective responsibility of NRC staff and in this respect laboratory Directors and the Management Committee serve as main focal points for this process. Our basic aim is to involve the vast amount of talent within NRC in the shaping of our future research to a greater extent than has been the case up to now.

While the new organizational structure will preserve vertical authority and responsibility, it will also increase our ability to manage interdisciplinary and interdivisional projects. Selected major research thrusts of this kind will be complementary to ongoing divisional programs. In adopting the modified program activities, policies and management system, the proven advantages of laboratory units, functional structures and individual initiative will be retained. A further overriding aim must be to maintain at NRC the stimulating atmosphere conducive to research which has been fostered over the years and which we all value very highly. This depends, however, far more on highly competent researchers with strong motivations and the opportunity to develop their special talents, than on particular organizational structures.

There are, however, very positive advantages in some instances in regrouping particular research activities. One such change, which I announced previously, involves the bringing together of a number of related research activities in astrophysics to form the new Herzberg Astrophysics Institute. Also, the Canada Institute for Scientific and Technical Information was recently officially inaugurated. Other regroupings or organizational changes may be desirable as ongoing programs develop or change and new programs are initiated.

In summary, NRC's redefined role is based on the following main features:

- * Modified objectives, sub-objectives and program.
- * Future NRC activities largely centered on its laboratories, with some extramural research to complement or extend intramural research.
- * Continuation of a combination of internally and externally generated research projects, including basic and exploratory research, but with greater emphasis on a selected number of major research thrusts, some of which may require interdisciplinary and interdivisional co-operation.

- * Continued support for a number of existing NRC activities together with greater emphasis on research problems of long-term national concern.
- * Continuing collaboration with government laboratories and universities on specific projects and close co-operation with the proposed new Natural Sciences Research Council.
- * Greater emphasis toward use of research results and transfer of technology to industry, including greater NRC initiative toward collaborative research with industry on selected projects.

In concluding this letter, I would like to emphasize that while the policies and programs outlined above represent some significant changes from the recent past, they also present NRC with new challenges and opportunities. Our success for the future will depend in large measure on our ability to respond positively to these challenges and opportunities. In this letter, the revised policy framework together with the background rationale has been presented in rather broad terms. A more concrete elaboration of policies and activities in a number of specific areas will be communicated in future letters. Finally, I would like to add that any comments or suggestions from staff on NRC policies and programs are, of course, most welcome.



W.G. SCHNEIDER,
President

NATIONAL RESEARCH COUNCIL OF CANADA

Engineering and Natural Sciences Research Program

OBJECTIVE

To provide a national foundation upon which to build for the creation, application and use of knowledge derived from the natural sciences and engineering.

SUB-OBJECTIVES

- * To promote, assist and perform research for the creation of new knowledge derived from the natural sciences and engineering.
- * To apply knowledge derived from the natural sciences and engineering to the solution of problems of national concern.
- * The application and use of engineering and the natural sciences to assist industry in Canada with the development of new and improved processes, methods, products, systems, techniques and services.
- * To develop and maintain national standards and criteria based on the natural sciences and engineering.

PROGRAM DESCRIPTION

Basic and Exploratory Research in the Natural Sciences and Engineering - Development of engineering fundamentals; acquisition of new engineering technologies; discovery of new applications for engineering technologies; development of scientific competence; acquisition of new scientific knowledge; discovery of new applications of science.

Research on Long-Term Problems of National Concern - Application of engineering and scientific expertise to the solution of long-term problems of national concern such as transportation, energy, food, building and construction.

Research in Direct Support of Industrial Innovation and Development - Performance and promotion of exploratory and applied research in selected areas for the advancement of technology required for Canadian industrial development; through effective methods of technology transfer, financial assistance and selected co-operative projects on processes, systems, materials and products, to strengthen the research, development and innovative capacity of industry in Canada.

Research to Provide Technological Support of Social Objectives -
Application of scientific and engineering expertise in
support of national objectives such as health, law, safety,
environmental quality and quality of Canadian life.

National Facilities - Provision and management of common purpose
national research and development facilities as a service
to industry, governments and universities.

Research and Services Related to Standards - Research in the
field of primary physical standards and provision of services
in support of national and international standards activities.

Administration - Administrative support including financial and
personnel services for this and other programs of the Council.

NATIONAL RESEARCH COUNCIL OF CANADA

Scholarships and Grants in Aid of Research Program

OBJECTIVE

To promote and support the development and maintenance of research and the provision of highly qualified manpower in the natural sciences and engineering.

SUB-OBJECTIVES

- * To support excellence in research for the creation of new knowledge in the natural sciences and engineering.
- * To promote and support the development of research in selected fields of regional and national importance.
- * To assist in the provision and development of highly qualified manpower.

PROGRAM DESCRIPTION

Peer-Adjudicated Grants - Grants for research expenses and equipment costs awarded to selected individuals and groups on the basis of peer adjudication.

Developmental Grants - Grants negotiated with individuals, groups (including multidisciplinary groups) and institutions for major research installations, research programs, special research projects and regional development of research capability, to meet needs or opportunities to contribute to the resolution of problems related to scientific, economic and resource development.

Highly Qualified Manpower Training and Development - Scholarships and fellowships awarded in national competitions to graduate students, postdoctorate fellows and senior scientists and engineers in universities and Canadian industry for advanced study or research and professional development; tenable in universities, industrial firms and other institutions in Canada and abroad.

National and International Activities - Grants to support national and international scientific and engineering conferences and studies, the exchange of scientists and engineers, and selected activities of scientific and learned institutions.

Administration - Administrative support services.

NATIONAL RESEARCH COUNCIL OF CANADA

Scientific and Technical Information Program

OBJECTIVE

To facilitate the use of scientific and technical information by the government and people of Canada.

SUB-OBJECTIVES

- * To provide and maintain services associated with scientific and technical information to meet the needs of the government and people of Canada.
- * To conduct research into the need for and methods of accomplishing the transfer of scientific and technical information in response to user needs.
- * To participate in the overall provision of library and information services for the government and people of Canada.

PROGRAM DESCRIPTION

Information Services - Operation and support of services to provide for the collection, storage, retrieval, analysis and transfer of scientific and technical information; support for the publication of journals of research in engineering and science.

Network Implementation - Implementation and maintenance of a Canadian network of scientific and technical information services and a referral service network including the establishment of links with other national and international networks and services.

Research and Development - Research into the requirements for collection, storage, retrieval, analysis and transfer of scientific and technical information; improvement of these and other related processes and development of new processes to meet the demonstrable needs of the users; development of standards, procedures and processes for inter-system exchanges of scientific and technical information through participation and agreement with other national and international organizations.

