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Guide to Acronyms and Abbreviations

Acronyms and Abbreviations

ACOA	Atlantic Canada Opportunities Agency
ALMA	Atacama Large Millimeter Array
AMTC	Aerospace Manufacturing Technology Centre
ATC	Aluminium Technology Centre
CBRN	Chemical, Biological, Radiation and Nuclear
CED	Canada Economic Development for Quebec Regions
CLS	Canadian Light Source
CPFC	Canadian Photonics Fabrication Centre
CTN	Canadian Technology Network
DND	Department of National Defence
DRDC	Defence Research and Development for Canada
G-7	Group of Seven
GTERC	Gas Turbine Environmental Research Centre
HR	Human Resources
IP	Intellectual Property
IPF	Industry Partnership Facility
ITA	Industrial Technology Advisor
NMR	Nuclear Magnetic Resonance
NPMR	Neutron Program for Material Research
NRC	National Research Council
NRC-BRI	Biotechnology Research Institute
NRC-CHC	Canadian Hydraulics Centre
NRC-CISTI	Canada Institute for Scientific and Technical Information
NRC-CSTT	Centre for Surface Transportation Technology
NRC-HIA	Herzberg Institute of Astrophysics
NRC-IAR	Institute for Aerospace Research
NRC-IBD	Institute for Biodiagnostics
NRC-IBS	Institute for Biological Sciences
NRC-IC	Innovation Centre
NRC-ICPET	Institute for Chemical Process and Environmental Technology
NRC-IIT	Institute for Information Technology
NRC-IMB	Institute for Marine Biosciences
NRC-IMD	Institute for Marine Dynamics
NRC-IMI	Industrial Materials Institute
NRC-IMS	Institute for Microstructural Sciences
NRC-IMTI	Integrated Manufacturing Technologies Institute
NRC-INMS	Institute for National Measurement Standards
NRC-IRAP	Industrial Research Assistance Program
NRC-IRC	Institute for Research in Construction
NRC-MTG	Manufacturing Technologies Group

NRC-NINT	National Institute for Nanotechnology
NRC-PBI	Plant Biotechnology Institute
NRC-SIMS	Steacie Institute for Molecular Sciences
NSERC	Natural Sciences and Engineering Research Council of Canada
OECD	Organisation for Economic Co-operation and Development
R&D	Research and Development
S&T	Science and Technology
SBDA	Science-based Department or Agency
SME	Small and Medium-sized Enterprise
SSHRC	Social Sciences and Humanities Research Council of Canada
STM	Scientific, Technical and Medical
TBS	Treasury Board of Canada Secretariat
TPC	Technology Partnerships Canada
TRIUMF	Tri-University Meson Facility

Section 1 Messages

Minister's Portfolio Message

I am proud to report on the measures being taken by the Industry Portfolio to help realize the government's goal of moving Canada into the ranks of the most innovative countries in the world by the year 2010. In today's global economy, innovation is the key to success. Thanks to innovation, we are finding new ways of thinking and better ways of working.

As the Minister responsible for the Industry Portfolio, I was pleased to be part of creating *Canada's Innovation Strategy*, which was launched in February 2002. Throughout the year, Industry Canada and its partners held 34 regional innovation summits and took part in many expert round tables and sectoral meetings. In all, the views of more than 10,000 Canadians were heard. That exciting and productive process culminated at the National Summit on Innovation and Learning, which brought together more than 500 business, government and academic leaders, as well as representatives from non-governmental organizations.

The Government of Canada is listening to Canadians. During the engagement process many excellent ideas were brought forward and, at the National Summit, were ranked in order of priority. Eighteen items were identified for action over the short term. I want to emphasize, however, that the process being discussed will be fully implemented over a 10-year period and must involve not only the Government of Canada, but all of its partners. Still, we have forged a very good beginning, and I am very encouraged by the positive response of the business and academic communities to the measures taken to date.

The Industry Portfolio's 16 member organizations work in partnership to ensure that Canadians have the support they need to meet the challenges of a rapidly evolving world economy. The cornerstone of all our future activities will be innovation.

It is my great pleasure to present the Report on Plans and Priorities for the National Research Council of Canada (NRC), which describes their expected achievements and results over the next three years. Plans and priorities for NRC continue with the implementation of Vision 2006 and the realization of its five strategic outcomes. New investments enable NRC to enhance its contributions to move Canada into the ranks of the most innovative countries in the world. In brief, NRC will pursue:

The Industry Portfolio is...

Atlantic Canada Opportunities Agency
Business Development Bank of Canada *
Canada Economic Development for Quebec
Regions
Canadian Space Agency
Canadian Tourism Commission *
Competition Tribunal
Copyright Board Canada
Enterprise Cape Breton Corporation *
Industry Canada
Infrastructure Canada
National Research Council Canada
Natural Sciences and Engineering Research
Council of Canada
Social Sciences and Humanities Research
Council of Canada
Standards Council of Canada *
Statistics Canada
Western Economic Diversification Canada

** Not required to submit Reports on Plans and Priorities*

- its leading role in R&D by pushing the frontiers of knowledge in new and existing research domains to help Canada create tomorrow's opportunities;
- initiatives fostering the development of community-based technology clusters across the country by enhancing its regional presence and building new R&D facilities;
- the dissemination of technology and knowledge to Canadians by creating new technology-based companies, enhancing the innovative capacity of firms and improving access to scientific, technical and medical information;
- efforts to expand the Canadian innovation system globally by strengthening existing international alliances and developing new ones and providing access to large-scale international S&T facilities.

We have made great strides forward in working with Canadians through the engagement process for *Canada's Innovation Strategy*. We connected with businesspeople, academics and private citizens in every region of the country. I am confident that this renewed partnership will flourish over the coming year and that the results of our efforts will mean more and better jobs, a stronger and more dynamic economy, and a better quality of life for all Canadians.

The Honourable Allan Rock

Message from the Secretary of State (Science, Research and Development)

It is an exciting time for Canadian science and technology. Investments in research and development, and in innovation infrastructure are paying dividends. New ideas are turning into new opportunities, benefiting Canadians in every economic sector across the country. Indeed, Canada can count itself among the leaders in the global race toward excellence.

Increasing Canada's capacity to innovate and creating a culture of innovation and creativity is at the heart of *Canada's Innovation Strategy*. The Strategy is a far-reaching microeconomic blueprint, encompassing not only science and technology, but also education, legal frameworks, taxation and skills development for all Canadians.

Canada's Innovation Strategy is a 10-year plan, bringing together the public, private and non-profit sectors to establish Canada as the global hub for investment and opportunity. Our emphasis on long-term innovation and knowledge creation across all sectors will translate into important benefits for business processes, health care, sustainable development and the protection of our natural environment. The Canadian science research and development community will play a major part in this vital initiative.

Knowledge is one of Canada's strategic national assets. As we build our science and research capacity, we will ensure that knowledge contributes to building the progressive and successful economy that will lay the foundation for future generations of Canadians.

As such, I am pleased to present the *2003-04 Report on Plans and Priorities* for the National Research Council Canada, outlining where our nation is headed, how we intend to get there and what we expect our achievements to be.

Hon. Dr. Rey D. Pagtakhan
Minister of Veterans Affairs and Secretary of State
(Science, Research and Development)

Management Representation Statement

MANAGEMENT REPRESENTATION REPORT ON PLANS AND PRIORITIES 2003-2004

I submit, for tabling in Parliament, the 2003-2004 Report on Plans and Priorities (RPP) for the National Research Council Canada.

This document has been prepared based on the reporting principles and disclosure requirements contained in the *Guide to the preparation of the 2003-2004 Report on Plans and Priorities*:

- It accurately portrays the agency's plans and priorities.
- The planned spending information in this document is consistent with the directions provided in the Minister of Finance's Budget and by TBS.
- Is comprehensive and accurate.
- Is based on sound underlying departmental information and management systems.

The reporting structure on which this document is based has been approved by Treasury Board Ministers and is the basis for accountability for the results achieved with the resources and authorities provided.

Name: _____

Date: _____

Mandate

The mandate of the National Research Council (NRC) is, according to the *National Research Council Act*, to “[...] undertake, assist and promote industrial and scientific research in the national interest of Canada”. Accordingly, NRC carries out leading-edge R&D in areas of importance to Canada, stimulates technology transfer and commercialization through research partnerships and collaborations with industry and universities, enhances productivity and innovation in small- and medium-sized enterprises (SMEs) through the NRC Industrial Research Assistance Program (NRC-IRAP), provides comprehensive, electronic, scientific and technical information to its clients and operates and manages important elements of the national scientific infrastructure on behalf of Canadians. Through entrepreneurship and active engagement with partners, NRC fosters the creation of new businesses and helps create and expand technology clusters in communities across Canada. Finally, through international collaboration, NRC raises the profile of Canadian science abroad and opens doors for global business opportunities for Canadian companies.

Vision 2006: Science at Work for Canada

During 2000-2001, NRC undertook extensive consultations to chart its course for the next five years. It engaged hundreds of stakeholders inside NRC, as well as from government, industry, academia and key interest groups to develop a sense of shared purpose in fostering innovation. The new Vision launched April 8, 2002 sets well defined targets and goals for NRC across a broad spectrum of activities from discovery to innovation.¹

NRC's Vision 2006

Recognized globally for research and innovation, NRC is a leader in the development of an innovative, knowledge-based economy for Canada through science and technology.

This Vision is founded on five strategic pillars:

- **OUTSTANDING PEOPLE – OUTSTANDING EMPLOYER:** recognition as a leading research organization distinguished by the excellence of creativity of its employees;
- **EXCELLENCE AND LEADERSHIP IN R&D:** integration of public and private strengths to create new opportunities and meet national challenges for Canada;
- **TECHNOLOGY CLUSTERS:** development of the innovative capacity and socio-economic potential of Canada's communities;
- **VALUE FOR CANADA:** commitment to the creation of new technology-based enterprises, technology transfer and knowledge dissemination to industry; and
- **GLOBAL REACH:** access to global research & information networks and science facilities, stimulation of enhanced international opportunities for Canadian firms and technologies.

¹ For details about the Vision launch, please visit http://www.nrc-cnrc.gc.ca/corporate/regional_innovation/newsroundtable_vii.html

Creating Value for Canada through Science, Technology and Innovation

NRC creates value for Canada and Canadians in many ways through its core strengths: some 3,600 highly-skilled staff, 18 research institutes, five technology and innovation centres, the NRC-IRAP and the NRC Canada Institute for Scientific and Technical Information (NRC-CISTI). NRC is an integral element of Canada's S&T community and plays a large part in advancing Canadian knowledge and R&D performance. It develops new technologies and technology-based enterprises, and uses innovative technology and knowledge transfer mechanisms to create wealth for Canada. It strengthens Canada's innovation system and fosters a culture of innovation essential to success in the global economy.

NRC works with partners from all sectors to build and improve the effectiveness of Canada's innovation systems by nurturing national and international networks and collaborations and fostering the growth of community-based technology clusters. NRC anticipates the future needs of knowledge-based industries, generates new knowledge and disseminates it through technology and knowledge transfer activities.

NRC continually develops new solutions, technologies that create new sources and improve the quality of life of Canadians. New higher-paying jobs in exciting new industries, cleaner production processes, new medical devices and treatments, developments in air transportation safety, and improved manufacturing and communications are just a few of NRC's contributions that affect the lives of Canadians and spark real opportunities for economic growth.

NRC has a strong focus on entrepreneurship, encouraging new research-based enterprises to spin out of its laboratories, enhancing its licensing activities and improving its dissemination and diffusion of technical information and advice. During 2001-2002, 72 firms were incubating at NRC. The past six years at NRC saw the creation of 52 firms, participation in literally thousands of collaborations and the issuing of hundreds of licenses to commercialize discoveries – activities that have generated valuable intellectual property, thousands of new technology-based, high-talent jobs and revenues for firms in excess of \$1 billion.

NRC creates value for Canada through:

- Advances in scientific knowledge
- National & international networks, linkages and partnerships
- Technology transfer activities
- R&D assistance to Canadian companies
- Creation of new companies and highly skilled jobs
- New and improved technologies
- Community-based technology cluster and innovation initiatives
- Scientific, technical & medical information
- Incubator facilities for young companies
- Standards, codes and measurement activities

Section 3

Plans and Priorities

Moving towards 2006

Year One of Vision 2006 has yielded promising results and plans for Year Three of Vision 2006 that will bring NRC closer to the realization of its strategic outcomes and goals. *Figure 2* on page 11 demonstrates how NRC's Vision 2006 and its strategic outcomes are consistent with the *Speech from the Throne's* (September 2002) theme to make Canada a magnet for talent and innovation. NRC is also aligned with other government priorities; *Appendix D* gives an overview of the linkages between NRC's Vision 2006 and the President of the Treasury Board's annual report to Parliament, *Canada's Performance*.²

The Road Ahead for NRC

NRC recognizes that today's research creates tomorrow's opportunities, and that sustained research efforts will bring social and economic benefits to Canada as well as advancing the frontiers of knowledge. With a unique national R-D infrastructure, NRC is well-positioned to improve Canada's innovation capacity in existing and emerging fields of research, build networks for researchers and entrepreneurs, train highly-qualified personnel, create new technology-based companies and jobs and transfer knowledge and technology.

Moving towards 2006 implies...

- expanding NRC's presence with new facilities across the country; from St. John's to Vancouver and in Ville Saguenay and Montréal;
- pushing the frontiers of knowledge in new domains of research (nanotechnology, fuel cells, photonics and genomics);
- developing new technology clusters in St. John's, Halifax, New Brunswick, Ville Saguenay, Montréal, Winnipeg, Saskatoon, Edmonton and Vancouver;
- creating new technology-based companies who employ highly skilled workers;
- offering technological and financial assistance to SMEs;
- supporting the Canadian industry needs through collaborative research, technical and calibration services;
- strengthening existing international alliances and developing new ones; and
- providing access to large-scale international S&T facilities.

Every year, social, economic, scientific and technological changes create new challenges from NRC in its ability to deliver on planned outcomes. Over the years, NRC has learned to adapt to these challenges in order to deliver on its intended strategic outcomes. Some of these positive challenges in 2002-2003 were a new government agenda, a better outlook on Canada's global competitiveness and the *National Summit on Innovation and Learning*.

² Please see *Canada's Performance* on-line at http://www.tbs-sct.gc.ca/report/govrev/01/cp-rc_e.html

Changes of directions and its impact on NRC's plans

The most recent *Speech from the Throne* (September 2002) entitled “*The Canada We Want*” outlines a new government agenda that builds on previous commitments (children, climate change and the environment, Canada’s place in the world, innovation), and sets forth renewed commitments (health care system, Aboriginals, communities, the government-citizen partnership and security). The Government of Canada remains committed to helping Canada become one of the most innovative countries in the world in terms of R&D

performance: “We want to be a world leader in innovation and learning, a magnet for talent and investment. We can build world-class cities and healthy communities.”³

The *National Summit on Innovation and Learning*⁴, held on November 18-19, 2002, was the culmination of six months of consultations with Canadians on the priorities and proposed actions of all stakeholders in the development of a National Innovation Strategy. NRC, as the Government of Canada’s premier research and innovation agency, will use the directions provided by the stakeholders to guide its future actions in priority areas such as R&D and commercialization and the development of internationally competitive technology clusters.

“We will be making more such concrete announcements to help create strategic clusters.

No one does a better job at applying knowledge -- of bringing new ideas and products swiftly to market than Canada's Small and Medium Sized Enterprises. SMEs have been by far the main source of job growth in Canada this past decade. Programs of the National Research Council have helped SMEs adopt new technologies and advanced manufacturing techniques. And we will do more.”

**Jean Chrétien, Prime Minister of Canada
November 2002**

(Opening Address of the National Summit on Innovation and Learning, delivered by Jane Stewart, Minister of Human Resources Development)

Challenges influencing NRC's strategic outcomes

Canada’s overall economic and innovation performance in the global arena has been the focus of national attention over the past few years. Recent data from the World Economic Forum⁵ confirms the statement made by the Minister of Finance during his *Economic and Fiscal Update* (October 2002) and restated in his *Budget Speech* (February 2003)⁶; Canada had the strongest economic growth rate amongst the G-7 countries for the first half of 2002 and forecasts seem positive for the coming years. To realize the Canadian goal of becoming one of the top five most innovative countries in the world in terms of R&D performance, Canada needs to become a magnet for talent and investment. This will lead to an improved quality of life for all Canadians and is the key to sustained economic growth.⁷

Over the past three years, the Government of Canada’s strong fiscal management policy has helped to generate a budget surplus. Part of the surplus has been used to create new extramural R&D programs

³ Speech from the Throne (September 2002), Government of Canada, September 2002. Available at <http://www.sft-ddt.gc.ca>

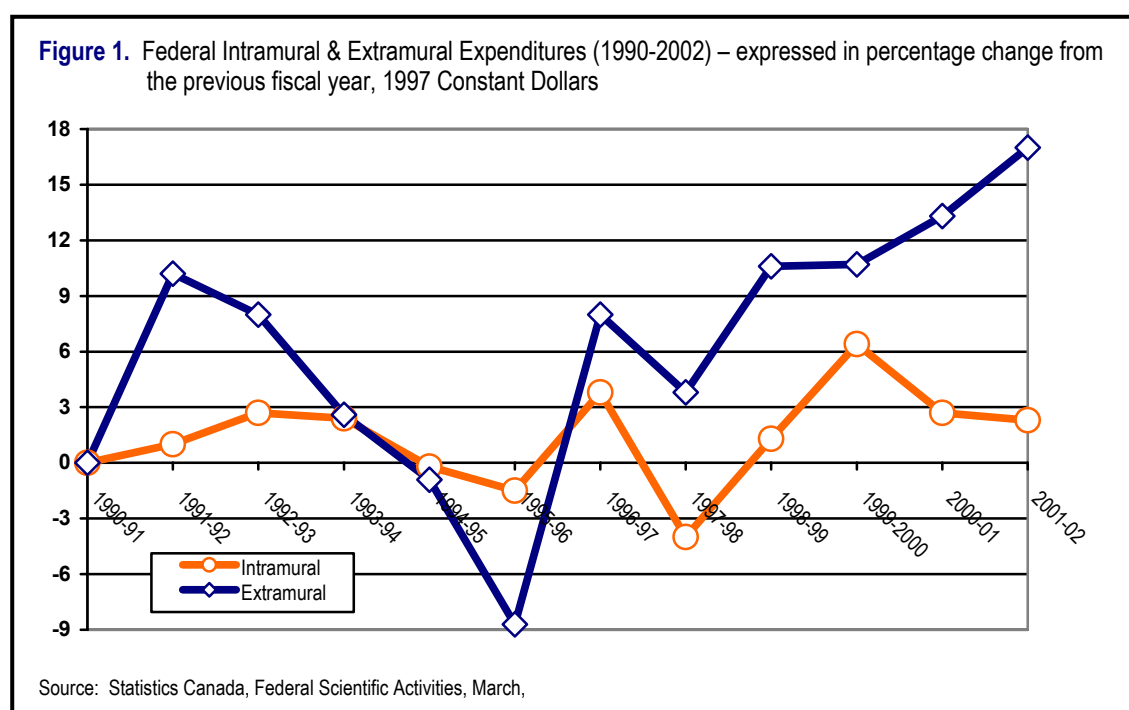
⁴ For more information on the *National Summit on Innovation and Learning*, please see <http://www.innovationstrategy.gc.ca>

⁵ *Global Competitiveness Report 2002-2003*, World Economic Forum, Oxford University Press for the World Economic Forum, November 2002. (<http://www.weforum.org/>)

⁶ Budget Speech 2003, Finance Canada, February 2003, <http://www.fin.gc.ca/budget03/speech/speeche.htm>

⁷ Economic and Fiscal Update, Finance Canada, October 2002, http://www.fin.gc.ca/toce/2002/ec02_e.html

(Canada Foundation for Innovation, Genome Canada, Canada Research Chairs) and augment funding for the granting agencies (Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada and the Canadian Institutes of Health Research). These investments signalled a new, more diversified approach to R&D funding, and overall government R&D expenditures increased by 138%⁸ in 2001-2002 from its 1997-1998 levels. However, intramural expenditures for federal science-based departments and agencies (SBDAs) have remained stable at \$1.9 billion over the same period. (See *Figure 1*.) NRC has been successful in securing funding for new community-based initiatives (technology clusters in Atlantic Canada in June 2000, other Canadian provinces in the Budgets of 2001 and of 2003) as well as for strategic initiatives in aerospace and health, NRC-IRAP and to secure Canada's participation in leading-edge astronomy projects. Nonetheless, NRC still faces the critical challenge of maintaining and developing its physical infrastructure associated with major national scale facilities at a world-class level.



Like other federal SBDAs, NRC is not alone in facing major human resources management challenges. Besides dealing with numerous retirements over the coming years, NRC faces considerable competition in attracting and retaining highly-skilled, talented and knowledgeable scientists, engineers, technicians and other professionals. NRC is committed, through its *Employment Philosophy* and new human resources (HR) management initiatives, to ensure that it remains a magnet for the most talented and imaginative workers.⁹

Strategic Partnerships and Collaborations

Strategic partnerships and collaborations are fundamental to NRC's way of doing business, whether they be government agencies, Canadian or international universities or industry partners. NRC

⁸ Based on data from Statistics Canada, Federal Scientific Activities, March 2002.

⁹ See "Outstanding People – Outstanding Employer" strategic outcome on page 32.

believes that one of the most successful ways to transfer knowledge is through collaborative research. NRC research institutes team up with industrial and university partners to co-develop new technologies and help to ensure their successful commercialization. Under such arrangements, both sides share funding and management of the research. Industry and university partners are involved early to ensure that projects align with both marketplace needs and NRC capabilities. Partners work side-by-side with NRC teams, increasing technical expertise in the firm and improving the odds for commercial success.

Linking NRC Plans and Priorities to Government Objectives

NRC has developed a preliminary results-based performance management framework against the goals and strategic outcomes of its vision.

The following pages outline a layered overview of NRC's *Vision 2006* and its objectives:

- Linkages between the Speech from the Throne and Vision 2006 (*Figure 2*);
- NRC's Strategic Outcomes (*Table 1*); and
- Summary of NRC's Plans and Priorities for 2003-2004 (*Table 2*).

Figure 2: NRC and Government-wide Objectives – How NRC ties into the theme of *A Magnet for Talent and Investment*.

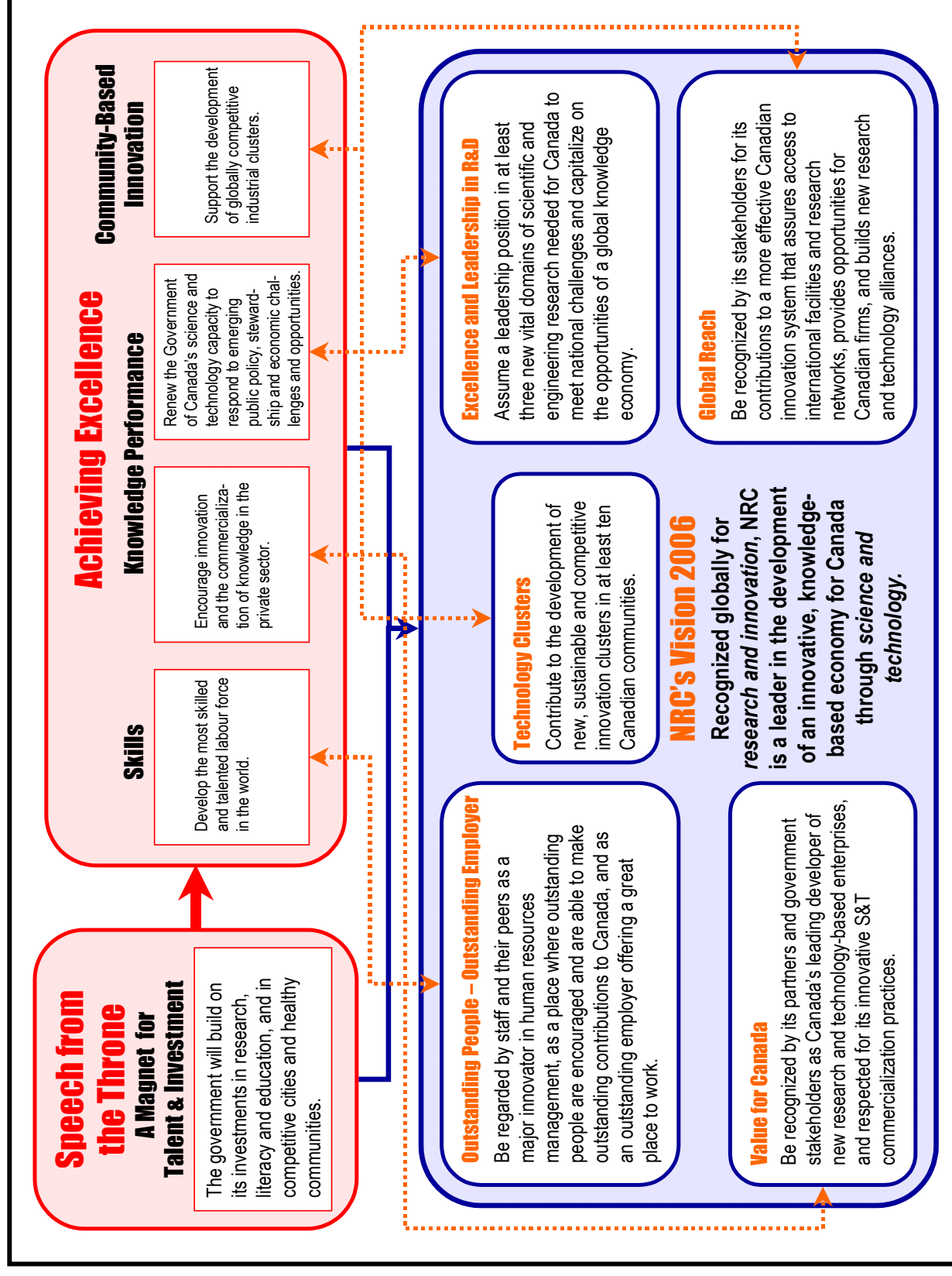


Table 1: NRC's Strategic Outcomes (Chart of Key Results Commitments)

DEVELOPMENT OF AN INNOVATIVE, KNOWLEDGE-BASED ECONOMY			
VISION 2006 STRATEGIC PILLARS AND OUTCOMES	VISION 2006 GOALS	RELEVANT BUSINESS LINE(S)	REPORTED ON PAGE
Outstanding People – Outstanding Employer <i>By 2006, NRC will be regarded by staff and their peers as a major innovator in human resources management, as a place where outstanding people are encouraged and are able to make outstanding contributions to Canada, and as an outstanding employer offering a great place to work.</i>	<ul style="list-style-type: none"> Recruit and retain highly qualified people Reward professional development and productivity Operate leading-edge facilities and equipment Provide an outstanding place to work 	<ul style="list-style-type: none"> BL 1, 2 and 3 BL 1, 2 and 3 BL 1, 2 and 3 BL 1, 2 and 3 	<p>p. 32</p> <p>p. 32</p> <p>p. 33</p> <p>p. 33</p>
Excellence and Leadership in R&D <i>By 2006, NRC will assume a leadership position in at least three new vital domains of scientific and engineering research needed for Canada to meet national challenges and capitalize on the opportunities of a global knowledge economy.</i>	<ul style="list-style-type: none"> Advance new and emerging research domains Demonstrate Canadian R&D leadership Stewardship for strategic large-scale S&T infrastructure Contribute to federal strategies and initiatives Conduct research that benefits Canadians 	<ul style="list-style-type: none"> BL 1 and 2 BL 1 and 2 BL 1 and 3 BL 1, 2 and 3 BL 1 and 2 	<p>p. 15</p> <p>p. 17</p> <p>p. 30</p> <p>p. 17</p> <p>p. 18</p>
Technology Clusters <i>By 2006, NRC will contribute to the development of new, sustainable and competitive innovation clusters in at least ten Canadian communities.</i>	<ul style="list-style-type: none"> Develop competitive research and technology base for cluster development Foster cluster champions, community leadership and strategies Demonstrate impacts of technology-based clusters 	<ul style="list-style-type: none"> BL 1, 2 and 3 BL 1, 2 and 3 BL 1, 2 and 3 	<p>p. 20</p> <p>p. 20</p> <p>p. 20</p>
Value for Canada <i>By 2006, NRC will be recognized by its partners and government stakeholders as Canada's leading developer of new research and technology-based enterprises, and respected for its innovative S&T commercialization practices.</i>	<ul style="list-style-type: none"> Create new technology-based companies Enhance the innovative capacity of firms Disseminate knowledge to Canadians Support the Canadian Industry 	<ul style="list-style-type: none"> BL 1 and 3 BL 1, 2 and 3 BL 1, 2 and 3 BL 1 and 2 	<p>p. 25</p> <p>p. 25</p> <p>p. 26</p> <p>p. 27</p>
Global Reach <i>By 2006, NRC will be recognized by its stakeholders for its contributions to a more effective Canadian innovation system that assures access to international facilities and research networks, provides opportunities for Canadian firms and builds new research and technology alliances.</i>	<ul style="list-style-type: none"> Integrate and facilitate international research Harmonize international standards Build new international S&T alliances Provide access to international research facilities Stimulate new foreign investments in Canada 	<ul style="list-style-type: none"> BL 1, 2 and 3 BL 1 BL 1, 2 and 3 BL 1, 2 and 3 BL 1, 2 and 3 	<p>p. 28</p> <p>p. 29</p> <p>p. 29</p> <p>p. 30</p> <p>p. 31</p>

Legend:

BL 1 – Research and Technology Innovation; BL 2 – Support for Innovation and the National Science and Technology Infrastructure; BL 3 – Program Management

Table 2: Summary of Plans and Priorities

STRATEGIC OUTCOMES	PROPOSED PLANS AND PRIORITIES	INTENDED OUTCOME / BENEFIT TO CANADIANS	EXPECTED TIMELINE
Outstanding People – Outstanding Employer	<ul style="list-style-type: none"> Fill new research positions in Atlantic Canada (NRC-IMD, NRC-IIT, NRC-IMB), at AMTC in Montréal, at NRC-NINT in Edmonton, at ATC in Saguenay and other new research facilities. Implement NRC-IRAP People Transition Plan Deploy the New Horizons – New Opportunities Program Implement NRC's Employment Philosophy and related HR management initiatives 	<ul style="list-style-type: none"> Premier research talent in existing and emerging R&D areas Reinforce and solidify the NRC-IRAP ITA network in every region of Canada Attract and retain 50 new top-notch researchers Be an HR management innovator by satisfying the goals of NRC's Employment Philosophy 	<ul style="list-style-type: none"> 2005 2003-2004 2003 On-going
Excellence and Leadership in R&D	<ul style="list-style-type: none"> Develop cutting-edge research programs in nanotechnology, genomics and proteomics, fuel cells, photonics and in other emerging domains Increase the number of peer-reviewed articles in all research domains Provide research results that benefit Canadians 	<ul style="list-style-type: none"> Leadership position in at least three new domains of research of importance to Canada Recognition of NRC's research excellence Build Canada's technology capacity, improve its R&D performance and support the needs of Canadian industry in emerging R&D areas 	<ul style="list-style-type: none"> On-going 2005-2006 On-going
Technology Clusters	<ul style="list-style-type: none"> Implement a national strategy for the development, construction and operation of Industry Partnership Facilities (incubators) Foster the development of emerging technology clusters in Atlantic Canada, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia 	<ul style="list-style-type: none"> A national network of industrial partnership facilities offering incubation services New, sustainable and competitive technology clusters in at least ten Canadian communities 	<ul style="list-style-type: none"> 2003 2005-2006
Value for Canada	<ul style="list-style-type: none"> Create new technology-based companies Transfer NRC technologies to Canadian companies through licensing agreements and collaborative research Develop and disseminate codes and standards for the construction industry Increase the innovation capacity of Canadian SMEs through implementation of the NRC-IRAP strategic plan Ensure Canadians have ready access to scientific, technical and medical information to support research and innovation 	<ul style="list-style-type: none"> New technology-based companies providing highly-qualified jobs to Canadians and stimulating new foreign investment in Canada Enhanced innovation capacity of companies and socio-economic growth through the diffusion of NRC technologies Publication of objective-based codes and guides to support the construction industry and promote innovation in this sector Enhanced innovation capacity of Canadian SMEs through technological advice and project financing Integrated national and international network of scientific, technical and medical information resources readily available to Canadians 	<ul style="list-style-type: none"> On-going On-going 2003 2006 2006

STRATEGIC OUTCOMES	PROPOSED PLANS AND PRIORITIES	INTENDED OUTCOME / BENEFIT TO CANADIANS	EXPECTED TIMELINE
<i>Global Reach</i>	<ul style="list-style-type: none"> Continue to be an active participant in international research through a continued presence in international fora and collaborations Support Canadian SMEs in facilitating access to international markets Promote the harmonization of international measurement standards through the implementation of the NRC-INMS strategic plan Provide stewardship of Canada's large-scale S&T infrastructure: TRIUMF, Neutron Program for Material Research, Canadian Light Source and the implementation of Canada's Long Range Plan in Astronomy 	<ul style="list-style-type: none"> Raise the profile of Canada as an S&T country, through new relationships and access and disseminate the knowledge from abroad to Canadians Enhanced innovation capacity of Canadians SMEs through international ventures and partnerships Harmonize international measurements standards to support international trade Canadian participation in leading-edge international science activities and development of large-scale S&T infrastructure of importance for the Canadian scientific and engineering community 	<ul style="list-style-type: none"> <i>On-going</i> 2006 2005 <i>On-going</i>

Excellence and Leadership in R&D

Outcome: By 2006, NRC will assume a leadership position in at least three new vital domains of scientific and engineering research needed for Canada to meet national challenges and capitalize on the opportunities of a global knowledge economy.

Strategies and Goals:

- Leadership in new and emerging research domains
- Excellence in R&D and innovation
- Stewardship of large-scale S&T infrastructure (*covered under Global Reach*)
- Contribution to federal strategies and initiatives (*covered in this section and Appendix B*)
- Research that benefits Canadians

Canada faces major challenges in areas such as industrial competitiveness and productivity, security, climate change, sustainable development, energy efficiency, the environment and health care. As a dynamic, national R&D organization, NRC helps address these challenges by conducting strategically-focussed collaborative research in emerging fields of science and engineering with industry, academia and government to build the future technology capacity that Canada will need to succeed in the years ahead.

Plans and Priorities:

Leadership in new and emerging research domains

Research leadership is at the core of NRC's mission and mandate. The coming years will see the emergence of totally new technologies resulting from research that cuts across traditional disciplines in biology, physics, chemistry, information technology, materials science and manufacturing. NRC plans to achieve key milestones in several emerging domains, more notably in the following:

Nanotechnology:

The NRC National Institute for Nanotechnology (NRC-NINT), in partnership with the Province of Alberta and the University of Alberta, will create programs to assemble atoms, molecules, nanoparticles or macromolecules to create new materials, devices or processes defined by critical length scales between 1 and 100 nanometres. NRC-NINT will take a systems level view of nanotechnology with a long-term goal to integrate biological and traditional information systems that:

- are self-assembled from components on a surface or self-supported in a liquid;
- are powered by local chemical sources;
- can be programmed to carry out a specific function or a set of functions; and
- are able to sense and respond to changes in the chemical and/or physical environment.

Progress in nanotechnology research has the potential for breakthrough applications in medicine and agriculture, the development of new materials, manufacturing and environmental technologies. Over the coming year, NRC plans to deliver on the following commitments to achieve its goals in nanotechnology:

- recruit 30 scientific, technical and support staff to work in project teams with university researchers;

- place five Research Associates in leading international nanotechnology laboratories;
- develop collaborations with leading national and international nanotechnology research institutions;
- increase R&D in complementary areas of nanotechnology across NRC such as industrial coatings from nanopowders and sprays, or from metallic or ceramic vapours, nanophotonics, quantum dots, and carbon nanotubes for energy storage; and
- establish alliances and networks with key nanotechnology stakeholders in industry, academia, and government both in Canada and internationally.

NRC's goal is that within five years, as a result of continued efforts, Canada will be recognized internationally as a key player in nanotechnology research and technology development.

Biotechnology, Genomics and Proteomics:

Over the past year, NRC has been developing strategic plans for its five biotechnology research institutes. NRC's governing Council has approved two strategic plans and the remaining ones will be completed by October 2003. Highlights of NRC's priority actions in biotechnology, genomics and proteomics in the coming year will be in the following areas:

- *Plant genomics and biotechnology:* launch Crops for Enhanced Human Health Initiative and expand functional genomics capability (cereals, medicinal plants) with an increased emphasis on nutraceuticals and functional foods;
- *Biopharmaceuticals and processes:* design, produce and purify reagents to support gene therapy research. In collaboration with Génome Québec, the NRC-BRI micro-array facility will be expanded to meet the needs of the genomics research community;
- *Vaccines and immunology:* work on the development of cancer vaccines, with a particular emphasis on understanding the underlying immune response mechanisms triggered by specific tumour-associated antigens;
- *Marine Biosciences:* increase work in systems biology and genomics in the marine context with applications for aquaculture and bioinformatics; and
- *Biodiagnostics:* increase research in imaging of infectious diseases in animal models in collaboration with Health Canada and the Department of National Defence.

Fuel Cells:

The NRC Innovation Centre (NRC-IC) will be leading the development of a coordinated NRC-wide research program to accelerate the application of fuel cell technologies in transportation and energy generation for the reduction of pollution and greenhouse gas emissions. NRC will pursue its leading-edge research in Proton Exchange Membrane fuel cells – including Direct Methanol Fuel Cells and Micro Fuel Cell development, Solid Oxide Fuel Cells, and fuel and oxidant systems in collaboration with universities, leading fuel cell developers and parts and component suppliers. To support this research, NRC-IC will complete the installation of a \$1.5 million environmental test chamber over the coming year, allowing for testing of full-scale fuel cell systems in winter and summer conditions.

Photonics:

Despite the market slowdown photonics remains a fast developing critical technology, which in the coming years will see broader applications beyond the first generation developments in telecommunications to industrial, medical, environmental and defence industries. The recent announcement of \$43 million in new funding from the Governments of Canada and Ontario for the creation of the Canadian Photonics Fabrication Centre (CPFC), as part of the NRC cluster strategy, will support new research and technology development with significant benefits to Canadian firms in this still emerging industry. Highlights of the NRC Institute for Microstructural Sciences (NRC-IMS) research plans in the coming year include:

- strengthened research efforts in nanodevices and quantum opto-devices. These efforts will move to proof-of-concept quantum devices for high performance lasers, spintronic detectors and modulators; and
- increased emphasis on emerging multidisciplinary research in biophotonics, nanophotonics and molecular electronics.

Spinning transistors

A team of scientists at NRC-IMS working in the area of quantum information and nanofabrication has successfully created a prototype of a "single spin" transistor made from a quantum dot. This is an important advance because current electronics, which depends on the charge of electrons, is approaching its technological limit. Consequently, researchers worldwide are looking at ways to exploit the quantum property of an electron, namely its spin. The prototype device created at NRC shows how a single-spin based transistor could work.

NRC will work closely with stakeholders such as the National Capital Institute of Telecommunications and the Canadian Institute for Photonic Innovations as well as Photonics Research Ontario and the Institut national d'optique to achieve these goals.

Excellence in R&D and Innovation

NRC has long held a leadership role in Canada for excellence in R&D and innovation. For example, the external peer review panel of the 2001 Evaluation of the NRC Biotechnology Program noted "that the quality of the science and of the investigators in general is high and in certain instances truly outstanding".¹⁰ Over the coming year, NRC will continue to emphasize excellence in R&D and innovation through increased research publications in internationally recognized peer-reviewed journals, especially in new emerging fields of science and engineering.

Contribution to federal strategies and initiatives

Biotechnology

As a major player in the Canadian Biotechnology Strategy, NRC's Biotechnology Group launched the *Genomics and Health Initiative* (GHI) in 1999 to bring the benefits of revolutionary advances in genomics, proteomics and health research to a variety of Canadian industrial sectors and regions. With this initiative, NRC, in collaboration with other federal agencies, industries and universities, is making key contributions to national efforts in the areas of genomics and health research. An overview of these activities is provided in *Appendix B: Government-Wide and Horizontal Initiatives*.

¹⁰ *Evaluation of the NRC Biotechnology Program, Peer Review Report*, February 2001, p. 3.

Climate Change and the Environment

NRC will continue to build upon and enhance existing programs that will contribute to Canada's commitment to reduce greenhouse gas emissions and improve the environment over the coming years. Examples of planned environmental research efforts beyond fuel cells, manufacturing, construction, aerospace and bioprocess include:

- the Canadian Hydraulics Centre (NRC-CHC) will expand the development of its environmental prediction and support systems simulation technology (EnSim™). This technology will be used to study and develop emergency responses to problems related to flooding, water borne pollution, sediment transport, water quality, dam breach, and oil spills.
- NRC-CHC recently initiated a five-year R&D program under the Climate Change Action Fund 2000 to develop advanced numerical models of granular multiphase flow targeted at reducing greenhouse gas emissions in a wide range of Canadian industrial processes including production of cement and aluminium, handling of biomass and mining.

Research that benefits Canadians

NRC's research covers a broad spectrum of science, engineering and technology and provides direct benefits to Canadians. NRC performs research and development to help improve Canada's R&D performance and support the needs of Canadian industry. In addition to the areas highlighted above, examples of intended outcomes over the planning period include the following.

Aerospace

As Canada's national aerospace laboratory, the NRC Institute for Aerospace Research (NRC-IAR) maintains core competencies and a world-class infrastructure in aeronautical R&D that are key to Canada's future. Research priorities for the NRC-IAR over the coming year include:

- conducting world-class R&D in support of industry to achieve increased levels of quality, environmental compatibility and airworthiness at low cost. (The most visible elements of this thrust are the new Advanced Manufacturing Technology Centre and the Gas Turbine Environmental Research Centre);
- building upon its expertise in advanced cockpit pilot-aircraft interfaces in the exploration of new designs, incorporating concepts in active controls and intelligent systems, and including new cockpit technologies based on enhanced synthetic vision capabilities;
- pursuing aircraft icing activity by proceeding with work on the extension of the Canada-U.S. Aircraft Icing Research Alliance with NASA and other partners; and
- building on its understanding of metallic corrosion and fatigue and their interaction, work on detecting and measuring damage, and developing life cycle management methodologies for damage control of aircraft and engine structures.

Ocean Engineering and Marine Industries

The Institute for Marine Dynamics (NRC-IMD) plans to enhance its research program in underwater vehicle technology, ice effects on marine systems, offshore engineering (including deepwater technology), engineering challenges in aquaculture and ship safety. NRC-IMD also plans to engage in collaborative projects in areas of sea ice, icebergs, deep-water and under-water vehicle technology propulsion. NRC-IMD will continue to develop its physical and numerical modeling expertise and will pursue research in ocean technology with a focus on commercialization opportunities.

Construction

Among the many R&D projects of the NRC Institute for Research in Construction (NRC-IRC) over the coming year, the following are of particular importance:

- develop and deploy software tools to predict the environment of open plan offices to design spaces that optimize cost, occupant satisfaction and productivity;
- improve the prediction and prevention of early-age cracking concrete structures in order to extend life by avoiding premature corrosion and deterioration and reducing repair costs; and
- develop non-destructive methods and models to alleviate corrosion and repair of corrosion-damaged concrete structures to help plan for inspections and repairs that minimize both risk of failure and operating costs.

Manufacturing

The NRC Manufacturing Technologies Group (NRC-MTG) Strategic Plan, approved in June 2000, lays out two long-term research thrusts: Virtual Manufacturing and Nanotechnology for Manufacturing. Over the past two years, the NRC Industrial Materials Institute (NRC-IMI), the Institute for Chemical Process and Environmental Technology (NRC-ICPET), the Integrated Manufacturing Technologies Institute (NRC-IMTI) and the NRC Innovation Centre (NRC-IC) have made significant progress in these areas. Over the coming year, NRC-MTG research priorities will be as follows:

Virtual Manufacturing

- virtual process modelling and intelligent diagnostics: to enhance research efforts in modelling, simulation, visualization and high performance calculation, which will lead to shorter processing time, lower costs and higher product quality; and
- virtual environment technology to facilitate the use of advanced visualization and virtual reality by Canadian companies for product design in immersive environments.

Nanotechnology for Manufacturing

- polymer nanocomposites for improved material performance and fire resistance;
- nanotechnology applications for the manufacture of new bio-medical materials; and
- nanotechnologies for sensors and environmental applications.

In support of these objectives, the NRC-MTG will launch new Special Interest Groups in polymer nanocomposites, next generation medical devices and web-integrated manufacturing for tools and moulds. These innovative collaborative arrangements will provide SMEs with early exposure to NRC research programs and improve the commercialization potential for new technologies.

Technology Clusters

Outcome: By 2006, NRC will contribute to the development of new, sustainable and competitive innovation clusters in at least ten Canadian communities.

Strategies and Goals:

- Competitive research and development base for cluster development
- Community involvement in technology cluster – local leadership and strategies
- Impacts of technology cluster activities

NRC is committed to catalyzing the growth of locally-based technology clusters across Canada. NRC's technology cluster strategy builds on existing local strengths by developing and transferring NRC R&D capabilities to industry, pulling together community strengths and supporting SMEs through NRC-IRAP. The ultimate benefit for Canadians of NRC's strategy is the emergence of globally competitive, community-based technology clusters leading to higher productivity, new jobs and expanded trade. NRC proactively engages local stakeholders to foster networking, leadership, and knowledge sharing. Over the past four years, NRC has been provided resources to implement its national Technology Cluster Strategy. This includes \$110 million over five years in June 2000 to develop clusters as part of the Atlantic Initiative and \$230 million over six years in the Budget of 2001 to expand cluster initiatives across Canada. And the Budget of 2003 announced two new regional innovation initiatives in Charlottetown (Prince Edward Island) and in Regina (Saskatchewan). The allocation of new funding for the implementation of NRC's Cluster Strategy is outlined in *Table 3*.

"The Research Institutes of the National Research Council Canada form the nuclei of technology clusters in areas such as biotechnology, aerospace, fuel cells and nanotechnology across Canada."

Achieving Excellence (one of the two discussion papers that form Canada's Innovation Strategy), page 46

Table 3: Allocation of New NRC Technology Clustering Resources

Location	Focus	Timeframe	Resources
St. John's (NF)	Ocean and marine technology	2000-01 – 2004-05	\$ 20 million
Halifax (NS)	Aquaculture & genomics	2000-01 – 2004-05	\$ 20 million
Fredericton (NB), Sydney (NS)	E-business and wireless	2000-01 – 2004-05	\$ 35 million
Charlottetown (PEI)	Bio-products	2000-01 – 2004-05	\$ 14 million
Saguenay-Lac-Saint-Jean (QC)	Aluminium	2002-03 – 2006-07	\$ 32 million
Montréal (QC)	Biopharmaceuticals Aerospace	2002-03 – 2006-07	\$ 5 million \$ 21 million
Ottawa (ON)	Photonics Aerospace	2002-03 – 2006-07	\$ 30 million \$ 22 million
Winnipeg (MB)	Medical diagnostics	2002-03 – 2006-07	\$ 10 million
Saskatoon (SK)	Plant biotechnology	2002-03 – 2006-07	\$ 10 million
Regina (SK)	Sustainable urban infrastructure	2003-04 – 2004-05	\$ 4 million

Table 3: Allocation of New NRC Technology Clustering Resources			
Location	Focus	Timeframe	Resources
Edmonton (AB)	Nanotechnology	2002-03 – 2006-07	\$ 60 million
Vancouver (BC)	Fuel Cells	2002-03 – 2006-07	\$ 20 million

Plans and Priorities:

Strategy for Industry Partnership Facilities: In support of its cluster development activities, over the planning period, NRC will develop, build and operate NRC Industry Partnership Facilities across Canada. (See *Table 4.*) These unique facilities will be workplaces for collaborative research, for the incubation of new firms and NRC spin-offs and as community resources for access to mentoring, innovation financing and competitive technical intelligence for new enterprises.

Table 4: NRC's Industry Partnership Facilities – Current and Planned			
Location	Area (in m²)	Status	Completion Date
Institute for Marine Dynamics (St John's, NF)	600	construction	2004-2005
Institute for Marine Biosciences (Halifax, NS)	2,000	construction	2003-2004
Institute for Information Technology, e-Business Centre (Fredericton, NB)	1,700	completed	2002-2003
Aluminium Technology Centre, (Chicoutimi, QC)	1,000	construction	2003-2004
Biotechnology Research Institute (Montréal, QC)	10,000	in operation	1998-1999
Industrial Materials Institute (Boucherville, QC)	1,860	design stage	2003-2004
NRC Industry Partnership Facility (Ottawa, ON) M-50 Facility	1,550	in operation	1998-1999
Institute for Biodiagnostics (Winnipeg, MB)	2,000	design stage	2004-2005
Plant Biotechnology Institute (Saskatoon, SK)	303	in operation	2002-2003
National Institute of Nanotechnology (Edmonton, AB)		planned	2004-2005
Herzberg Institute of Astrophysics (BC) Penticton Facility	125	in operation	2001-2002
Victoria Facility	200	in operation	2001-2002
Total	21,338		

Newfoundland – Ocean and marine technologies

NRC-IMD has been working closely with the Genesis Centre of Memorial University of Newfoundland to assist in the creation of firms over the past year. A community-based cluster working group, named Oceans Advance, was created. This group spearheaded the Ocean and Marine Technology Roadmap that plans to report on its findings in 2003. In the coming two years, NRC-IMD plans to complete the construction of an Industry Partnership Facility intended to bolster technology cluster growth in St. John's. This IPF will house a Young Entrepreneurs Programs to help new graduates build and grow their technology-based firms in Newfoundland.

Nova Scotia – Life sciences and marine biotechnology

The NRC Institute for Marine Biosciences (NRC-IMB) is committed to playing a leadership role in the development of a thriving life sciences cluster in the Atlantic region through activities such as managing a DNA sequencing platform for all Genome Canada projects in Atlantic Canada and the Canadian Bioinformatics Resource for applications in aquaculture and genome sciences. The NRC

Institute for Biodiagnostics (NRC-IBD) will also contribute to the Brain Repair Centre in Halifax. Within the coming year NRC will have completed the construction of this Industry Partnership Facility and is targeting 75% occupancy by 2005. As co-chair, NRC is working closely with the Halifax-based Life Sciences Development Association to achieve the local clustering goals.

New Brunswick and Cape Breton (Nova Scotia) – e-Business and wireless technologies

NRC-IIT completed the construction of the e-business facility in Fredericton in the fall of 2002 and new staff has been hired. NRC-IIT's strategy is to contribute to the emergence of a regional e-business and e-learning cluster in Fredericton, Moncton and Saint John. In Cape Breton, NRC-IIT will develop a community-based capability in wireless technologies. Over the five-year period 2000-2005, new funds from the Atlantic Canada Opportunities Agency and NRC, totalling \$44 million, will be spent as follows:

Table 5: Allocation of Resources for NRC-IIT Activities in Atlantic Canada (2000-2005) (millions of dollars)	
Fredericton	\$25.5
Saint John	\$4.5
Moncton	\$4.5
New Brunswick network	\$3.0
Sydney	\$6.5
Total	\$44.0

Quebec – Aerospace manufacturing, biopharmaceuticals and aluminium technology

NRC will be heavily involved in Quebec-based technology cluster development over the coming three years.

The **NRC Aerospace Manufacturing Technology Centre (AMTC)**, being developed on the campus of the Université de Montréal in partnership with Canada Economic Development for Quebec Regions, will expand NRC expertise and facilities to better assist industry to develop, demonstrate and implement advanced manufacturing methods for aerospace. The new research programs at AMTC will focus on the SMEs supply chain in the aerospace industry. NRC-IAR will also seek to establish links with related research programs elsewhere and work with the NRC-IRAP network to facilitate partnerships with SMEs.

Construction of AMTC commenced in August 2002 and plans are for it to be operational in spring of 2004. Senior staff has been hired in the areas of Robotics/Automation, Composite Materials, Machining, and Joining. A temporary location has been acquired recently to house the growing complement of staff and equipment.

The **NRC Biotechnology Research Institute (NRC-BRI)** is strongly positioned within the biopharmaceutical and environment clusters at regional, national and international levels. In 2003-2004, NRC-BRI will create links or engage in collaborations with the partners listed below.

- NanoQuébec: a major grouping of academic institutions and industry for the development of nanotechnology;

- the Green Chemistry Network for Sustainable Development in Montréal;
- Montréal Centre of Excellence for Brownfields Restoration to extend collaborations in bioremediation, phytoremediation and biomonitoring activities; and
- the Life Sciences Cluster through interactions with the Montréal International Initiative.

The recently announced \$300 million planned investment by DSM Biologics, when completed, will position Montréal as one of the three world-leading manufacturing centres of biopharmaceuticals in the world.

Based on recommendations from the Canadian Aluminium Industry Technology Roadmap, the Government of Canada's October 2001 announcement to create the **NRC Aluminium Technology Centre** (ATC) under the initial management of NRC-IMI will provide industry, particularly in the Saguenay-Lac-Saint-Jean region, with the technical support and expertise required to develop value-added aluminium-based products and services. The ATC is located on the Université du Québec à Chicoutimi campus, in Saguenay-Lac-Saint-Jean. In partnership with Canada Economic Development for Quebec Regions, NRC-IMI will contribute in the development of a technology cluster to promote growth, productivity and job creation in the region. ATC combines R&D activities for value-added aluminium products, such as process simulation and instrumentation used in the transformation of aluminium into finished and semi-finished products. The announcement by Alcan to invest \$10.5 million in the centre will further strengthen ties between the ATC and industry.

Ontario – Photonics and aerospace

The **Canadian Photonics Fabrication Facility (CPFC)**, announced in November 2002, will be a strategic addition to the local photonics infrastructure that will significantly increase the industry's competitive advantage by filling the void in prototype development and testing. NRC-IMS will work closely with existing world-class companies, and R&D infrastructure in universities and government to enhance the innovation capacity and growth of the photonics industry in Canada. NRC-IMS and Carleton University will leverage their existing research activities and equipment and their incubation and partnership facilities to support the growth of Canada's largest concentration of photonics private sector activity.

At the new **Gas Turbine Environmental Research Centre** (GTERC) being built in Ottawa, NRC-IAR and Pratt & Whitney Canada will work together on a broad range of gas turbine testing services such as icing, endurance testing and developmental work for low greenhouse gas emissions. The GTERC, a 1,670m² building, will simulate operation at high altitudes and low temperatures, in compliance with increasingly stringent environmental and safety requirements. The GTERC construction started in late summer 2002. Plans are to complete the building and commission the Altitude Test Facility by the fall of 2003. The compressors for combustion research will be installed and commissioned by the first quarter of 2004.

Manitoba – Medical devices technologies

NRC-IBD will make expansion of the Winnipeg-based medical devices cluster a priority in the coming years. The Infectious Disease Program will encourage more linkages with other departments including Health Canada and the Department of National Defence. The new Industry Partnership Facility, currently in the design phase, will catalyze cluster development resulting in new company formation and high tech spin-offs in the coming years.

Saskatchewan – Plant biotechnology

NRC's recently approved strategic plan for the Plant Biotechnology Institute (NRC-PBI) outlines the following priority actions and outcomes for the coming three years:

- strategic alliance agreement with the Agriculture and Agri-Food Canada Cereal Research Centre with a focus on advanced crops for human health;
- incubation of five new companies that have established operations in NRC-PBI;
- linkages with the Canadian Light Source through establishment of a project on protein structure and function;
- expansion of NRC-PBI genomics capabilities, and the nuclear magnetic resonance and mass spectroscopy facilities, to provide the research community with state-of-the-art services; and
- full occupation of the recently completed Industry Partnership Facility.

Alberta – Nanotechnology

Over the past year, NRC has made considerable progress in developing strong ties in Alberta for the development of a nanotechnology cluster. NRC-NINT has appointed a Director of Stakeholder Relations and a communications officer. NRC-NINT is working with the University of Alberta Industry Liaison Office and the City of Edmonton Economic Development to provide near-term benefits to the community as it builds research capacity. The goal is to foster the development of a nanotechnology community and start-up firms by 2005. Priorities for the coming year include:

- completion of arrangements with university, provincial and regional partners on intellectual property and commercialization agreements;
- three research workshops to be held in Edmonton relevant to community interests, particularly in energy and biochips;
- initiation of a business competitive intelligence function; and
- engagement of business leaders through industry partnership agreements.

British Columbia – Fuel Cells

In March 2002, Allan Rock, Minister of Industry, announced \$20 million over five years in new funding to NRC in support of the emerging fuel cell and hydrogen technologies cluster. NRC-IC will use these funds to leverage its investments, increase research staff, strengthen its fuel cell testing and demonstration program, expand its contributions to training people for the fuel cell sector and enhance its role as a showcase for innovative Canadian technologies and companies. NRC staff work with industry partners such as Fuel Cells Canada, as well as individual firms and universities through collaborative R&D projects. Over the coming planning period, NRC expects to achieve the following outcomes:

- continued growth of the fuel cell industry in B.C., as well as Alberta, Ontario and Quebec;
- completion of a 557.4 m² of hydrogen safe testing and acceleration space by 2005;
- increased client use of testing and evaluation services by 2004;
- increase in resources applied to fuel cell R&D in each regional cluster; and
- creation of new fuel cell related companies through spin-ins and spin-offs.

Value for Canada

Outcome: By 2006, NRC will be recognized by its partners and government stakeholders as Canada's leading developer of new research and technology-based enterprises, and respected for its innovative S&T commercialization practices.

Strategies and Goals:

- Creation of new technology-based companies
- Enhanced innovation capacity of firms
- Improved dissemination of knowledge
- Supporting the Canadian industry

NRC creates value for Canada and its industry through research, innovation and commercialization activities. NRC continues to foster entrepreneurial thinking and action and seeks to accelerate technology transfer, knowledge dissemination, and the development of new research-based technology enterprises and jobs for Canadians. In 1996 NRC launched the *Entrepreneurship Program* to promote the commercialization of technologies through which NRC made a major commitment and dedicated considerable effort to actively encourage the spin-off of new research-based enterprises from NRC laboratories. NRC-IRAP helps to increase the innovation capacity of Canadian SMEs.

Plans and Priorities:

Creation of new technology-based companies

Due to its success so far in new venture creation and the value this activity creates for Canada, NRC remains committed to pursuing the creation of new technology-based companies as an important method of commercializing NRC technologies. On average, NRC has been able to create seven new companies per year since 1995. NRC expects to match or surpass this average for the planning period, depending on economic conditions for business start-ups.

Building on the success of its *Entrepreneurship Program*, NRC is enhancing its efforts by launching a *New Ventures Program* targeted at NRC scientists and engineers who want to launch or assist in launching a technology-based venture. The *New Ventures Program* will be the focal point for spin-off activity at NRC. Through innovative business commercialization models and activities to support entrepreneurship (Business Case Challenges, Entrepreneurs in Residence, training and community/industry involvement), the Program will assist in the creation of new technology-based ventures that are well positioned to transition to the market, work to accelerate new venture development and encourage an internal entrepreneurial culture within NRC, manage the relationships and agreements with existing NRC spin-offs and provide guidance. As the market changes, the Program will ensure that NRC entrepreneurship policies adapt appropriately and meet the needs of both industry and NRC.

Enhanced innovation capacity of firms

The management of intellectual property (IP) is important for extracting value from IP and enhancing the innovative capacity of firms. Patents and/or other forms of IP protection are a key step in the continuum from discovery to commercialization. License agreements show a direct flow from

research innovation to business applications. The large number of license agreements for NRC technology is a strong indicator of the relevance and inherent value of NRC's R&D activities.

NRC Industrial Research Assistance Program

NRC-IRAP is the main instrument of the Government of Canada for innovation and technology assistance for SMEs. Through its 60 years of existence, NRC-IRAP has helped countless SMEs become more competitive and increase their innovative capability. The recent evaluation of the Program confirms this.

In June 2002, the NRC governing Council approved the NRC-IRAP strategic plan. The plan establishes two new strategic objectives: (1) to increase the innovative capacity of SMEs and (2) to become the national enabler of technological innovation for Canadian SMEs. The five strategic directions that support NRC-IRAP's two strategic objectives are:

- strengthen innovation capacity of SMEs;
- extend Canada's innovation system internationally;
- nurture community innovation;
- create a national competitive technology intelligence capacity; and
- translate publicly funded R&D into innovation.

Primary Targets for SME Success

1. NRC-IRAP supported small firms will develop their innovation capabilities and grow into medium-sized firms with international involvement and participation (target client profile: 35% of firms with 50+ employees).
2. Firms will leverage up to twice the amount of R&D investments from other sources.
3. Firms will generate \$20 in new sales for every dollar invested by NRC-IRAP in new competencies, products and processes.
4. Innovative, risk-taking start-up firms supported by NRC-IRAP will have a 20% higher survival rate beyond three years than similar non-supported firms.
5. 25% of NRC-IRAP clients will be ready to pursue international technology opportunities and alliances.

Improved Dissemination of knowledge

NRC Canada Institute for Scientific and Technical Information (NRC-CISTI)

As Canada's national science library and the largest Canadian publisher of scientific, technical and medical (STM) information, NRC-CISTI plays a crucial role in assuring that Canadians have and continue to have ready access to the STM information required to support their research and innovation activities.

Currently, there is a key opportunity for NRC-CISTI and Canada to develop a national STM digital library network where STM information and value-added services are delivered electronically and seamlessly to Canadians. Partnerships with academic, medical, industry and government STM information providers will be key to the realization of this vision. With its network of national and international partners, infrastructure and business systems, NRC-CISTI is positioned to play a leadership role in developing such a network. NRC-CISTI's key planned results will build the foundation for realizing this goal.

In partnership with NRC-IRAP, NRC-CISTI will ensure maximum benefits to Canadian SMEs by enhancing the NRC-CISTI support to NRC's technology cluster strategy as follows:

- enhanced activities at existing NRC Information Centres across Canada;

- new NRC Information Centres to serve new technology clusters;
- enhanced services to companies in Industrial Partnership Facilities; and
- new value-added products and services, such as competitive technical intelligence and technology roadmapping.

Supporting the Canadian industry

Construction Codes and Standards

The NRC Institute for Research in Construction (NRC-IRC) is taking a leadership role in developing a national innovation strategy for the Canadian construction sector. NRC-IRC organized an international symposium that brought together Canadian industry leaders with international experts to learn from best practices. As a result, a National Steering Committee for Innovation in Construction was formed. One of the key messages from the Committee was that the construction industry relies heavily on communal knowledge rather than on protection of intellectual property. Codes, standards and guides are critical tools for consolidating knowledge, reducing transaction costs and facilitating the introduction of new products and processes to the sector. In support of these objectives NRC-IRC will:

- launch the first ever objective-based national building, fire and plumbing codes and companion users' guides;
- release, in collaboration with the Federation of Canadian Municipalities, the first edition of the National Technical Guide for Sustainable Municipal Infrastructure;
- publish guidelines for the repair of utility cuts in urban roads; and
- publish guidelines for the design of thermal and moisture management strategies for building wall systems and roofing assemblies.

NRC-Centre for Surface Transportation Technology (NRC-CSTT):

NRC-CSTT envisages creating deterioration management services to reduce costs and increase life cycles for large ground-vehicle fleets (military, railroad, transit buses). By the end of 2005-2006, NRC-CSTT plans to have in place significant Integrated Logistics Support services specializing in the development and execution of supportability plans and services that will make large measurable differences in vehicle fleet performance. Also by the end of 2005-2006, NRC-CSTT anticipates having substantial new partnerships in military vehicle mechanical design and production, advanced vehicle electronics, development and support of software packages, and maintenance of railway freight car bogies.

NRC-Canadian Hydraulics Centre (NRC-CHC):

NRC-CHC will further enhance its advanced numerical models and decision support systems to study and help solve a diverse range of water-related problems, such as ice jamming in the St. Lawrence Seaway and the effects of coastal and inland flooding caused by natural disasters. NRC-CHC will continue providing sophisticated physical modelling expertise to help assess environmental impacts and optimize the design of ports, coastal and offshore structures, as well as addressing renewable energy projects such as windmill farms and wave energy devices.

Global Reach

Outcome: By 2006, NRC will be recognized by its stakeholders for its contributions to a more effective Canadian innovation system that assures access to international facilities and research networks, provides opportunities for Canadian firms, and builds new research and technology alliances.

Strategies and Goals:

- Integration and facilitation of international research
- Harmonization of international standards
- New international S&T alliances
- Access to international research facilities
- Stimulation of new foreign investments in Canada

For Canada, international technology development and business and investment opportunities have risen significantly since 1995 and are projected to grow further by 2006. In the words of the Prime Minister's Advisory Council on S&T, "Canada will become a country that, within the limits of our resources, takes maximum possible advantage of international opportunities in support of advancing scientific research, industrial innovation and improvements in the quality of life for Canadians."¹¹

NRC has been enhancing its international reputation and credibility to develop a valuable network of technical and scientific contacts and intelligence. This knowledge and expertise is used to transfer S&T information to Canadian firms, universities and other government departments and also to leverage new innovation opportunities for Canadian industry internationally. NRC also takes the lead on international technology missions and facilitates vital connections to centres of advanced technology around the world.

Plans and Priorities:

Integration and facilitation of international research

NRC's growing role as an integrator and facilitator of international research is evidenced in its participation on international committees and representation at international conferences. In 2001-2002, NRC employees participated on 589 international committees and attended 646 international conferences. NRC also organized 105 international conferences and workshops.

In the coming year, NRC will continue to build networks, collaborations and strategic alliances around the world for Canada through bilateral and multi-level agreements, technology and research alliances, as well as through over 60 formal collaborative agreements with 22 nations. NRC conducts numerous technology missions or visits in specific areas of specialization to countries around the globe. For example, follow-up from two missions to Taiwan has led to new opportunities for collaboration in nanotechnology and aerospace. NRC will focus particular attention on building stronger research ties with Germany, Spain, Mexico and India in 2003-04.

¹¹ "Reaching Out: Canada, International Science and Technology, and the Knowledge-based Economy" (May 1999)

Supporting Canadian SMEs

Under the strategic plan approved by NRC's governing Council in June 2002, NRC-IRAP will extend Canada's innovation system internationally, and facilitate SME access to foreign technology, alliances and markets via visits/missions, joint ventures and partnerships, collaborative R&D projects and relevant international organizations. The key planned results of this strategy by 2006 will be:

- increased SME participation in international relationships, technology collaborations and joint ventures resulting in increased access through technology to domestic and international markets;
- increased SME access to competitive technology intelligence and international funding opportunities; and
- increased exploitation of international technologies by SMEs.

To achieve these goals NRC-IRAP will undertake the following activities over the coming year:

- develop a program-wide international strategy and links with other focus areas; and
- establish a national coordination function for international activities.

Harmonization of international measurement standards

Canada's goal to rank among the top five industrialized countries in R&D by the year 2010 will require an estimated \$250 billion¹² increase of technology-based trade. The NRC Institute for National Measurement Standards (NRC-INMS), as Canada's national metrology institute, must ensure that international recognition and acceptance of Canada's national measurement system remains solidly in place, and that our capabilities grow to serve emerging industry sectors that will fuel this trade. The NRC-INMS Strategic Plan, approved by NRC's governing Council in June 2002, lays out five core strategies to address these challenges:

- lead R&D activities to meet current and future Canadian needs for primary measurement standards, methods and calibration capabilities;
- ensure adequate dissemination of calibration and measurement services, including improved and expanded services, and calibration services arising from R&D;
- maintain a recognized leadership role in supporting Canada's national and global trade interests through strengthened participation in international metrology activities;
- provide leadership for the creation of a national coordinating body for the Canadian national measurement system; and
- lead the dissemination of measurement-related knowledge and technologies to all sectors of Canada through adequate outreach and training.

New international S&T alliances

NRC collaborates with international partners to create new technologies and improve existing products and services. Collaborations range from projects with individual researchers or teams of researchers in universities to multi-partner arrangements. In 2003-2004, NRC will continue to advance its activities in the context of the 355 formal international collaborative agreements currently in place involving more than 500 partners from private, public and university sectors and valued at \$146 million. In the coming year, NRC will be involved in a number of major international missions

¹² Based on calculations of Industry Canada's Policy Sector, which estimates the amount of R&D required to get Canada in the top five of the most industrialized countries in R&D.

such as the 2003 Team Canada Mission to London, Milan and Amsterdam (the first time science and technology has been integrated into the Mission objectives) and Biotech India 2003 , which is expected to lead to new S&T alliances that will be of benefit to Canadian industry and science.

Access to international research facilities

NRC provides stewardship over Canada's investments in large-scale S&T infrastructure of critical importance to the research community and ensures Canada's reciprocal participation in leading edge international science activities around the world. NRC's involvement is essential in initiating, planning and developing such facilities. Large-scale research facilities include:

NRC Herzberg Institute of Astrophysics:

As the mandated agency for the operation and administration of any astronomical observatories established or maintained by the Government of Canada, NRC-HIA is the lead agency for the implementation of the Canadian Long Range Plan in Astronomy. As part of its commitment to this plan, NRC-HIA will, in the coming year:

- participate in the Atacama Large Millimetre Array (ALMA) and construct a correlator for the U.S. Expanded Very Large Array as part of the ALMA partnership, as announced in the Budget of 2003;
- participate in the development of an advanced new adaptive optics system for the Canada-France-Hawaii Telescope;
- represent the Government of Canada in discussions with the international astronomy community on the next generation Large Optical Telescope; and
- provide engineering and scientific contributions in assisting the Canadian Space Agency and industry to develop a main guidance camera and participate in the main near-infrared camera for the James Webb Space Telescope.

TRIUMF (Tri-University Meson Facility):

TRIUMF, Canada's national particle and nuclear physics laboratory, provides world-class facilities for life sciences and condensed matter research. TRIUMF also provides a platform for Canadian scientists to participate in experiments outside Canada, notably at CERN (Switzerland), and to encourage the transfer of technology developed at the laboratory to the commercial sector. Main thrusts in the coming year are to:

- further evolve the scientific program with accelerated radioactive beams to open up new vistas in experimental astrophysics;
- continue construction of the ISAC-II facility;
- complete Canada's contribution to the Large Hadron Collider project at CERN; and
- develop TRIUMF's five-year plan for 2005- 2009.

Canadian Neutron Beam Laboratory:

The Neutron Program for Materials Research (NPMR) operates Canada's neutron beam laboratory as an international user facility, one of about twenty such facilities worldwide. Collaborative scientific programs are carried out on a wide range of topics: membrane biophysics, magnetism, superconductivity, geo-sciences, materials science in nano-scale devices and materials process engineering. In the coming year, the NPMR will

- develop a new method for atomic-resolution holographic imaging of non-crystallized biological structures;
- build a dedicated neutron reflectometer to meet the growing demands related to manufacturing of bio-compatible coatings (heart valves, implants), organic electronic and nano-magnetic devices; and
- work toward the goal of stimulating 50% more direct industrial access to neutron scattering knowledge with the aim of opening new markets, developing new products and contributing to public safety.

Canadian Light Source (CLS):

The Canadian Light Source (CLS), Canada's synchrotron, is a third generation 2.9 GeV synchrotron, owned and operated by the University of Saskatchewan. It is currently under construction at a cost of \$174 million and scheduled for first "light" in January 2004. The capital funding of this national facility derives from 14 different funding partners including NRC. A large interdisciplinary user community, of which NRC has several members, is now involved in the construction and commissioning of seven beam lines. The principal thrusts over the coming year are to:

- finish construction of the synchrotron and commission the initial suite of beam lines;
- demonstrate global leadership in synchrotron research and development, and innovative industry partnerships;
- become the recognized national centre of excellence and repository of academic and operational expertise in synchrotron science and technical applications;
- advance industrial competitiveness and support entrepreneurial commercialization opportunities; and
- provide a national venue for scholarly collaboration for academic, government and industry partners, and facilitate cooperative fundamental and applied science and technology projects.

Stimulation of New Foreign Investments in Canada

The June 2002 announcement by Dutch-based DSM Biologics of its plans to invest over \$300 million in biopharmaceutical manufacturing capabilities over the coming five years in close collaboration with NRC-BRI in Montréal is indicative of the long-term potential impact of NRC's Global Reach Strategy. Over the coming year, NRC will continue to build on established international linkages to stimulate direct foreign investments in Canada through:

- attracting off-shore venture capital investments for new company creation either through NRC spin-offs or licensing of NRC technologies;
- NRC participation and follow-up in key international technology fora such as Bio 2002 held in Toronto and Biotech India 2003 where important linkages are made with international investors;
- NRC sponsored fora such as Bio Crossroads held every year in Montréal, which typically attracts major investors from North America and Europe; and
- continued building of strong international research collaborations in key emerging scientific and engineering fields.

Outstanding People – Outstanding Employer

Outcome: By 2006, NRC will be regarded by staff and their peers as a major innovator in human resources management, as a place where outstanding people are encouraged and are able to make outstanding contributions to Canada, and as an outstanding employer offering a great place to work.

Strategies and Goals:

- Highly qualified personnel
- External and internal awards
- Research facilities and equipment
- Activities promoting an outstanding work environment

Outstanding people are at the core of NRC and are its most valuable asset. NRC continues to face strong competition in finding and keeping premier research talent, and continues to meet other HR management challenges, like numerous retirements over the coming years. Therefore it is essential that NRC remains strongly committed to its employees through its *Employment Philosophy* and other HR management initiatives so as to maintain its long-standing international reputation for excellence and creativity in leading-edge research and innovation.

Plans and Priorities:

Recruitment and retention of highly qualified personnel

Rewarding professional development and productivity

Progress has been made over the last three fiscal years in recruiting and filling vacant positions for highly qualified personnel. In 2000-2001 NRC announced that technology cluster initiatives in Atlantic Canada and in Montréal (AMTC) would create 100 and 50 new research positions, respectively. To date, 48 scientists, engineers and technicians were hired and NRC is committed to fill the remaining positions over the course of the planning period. For NRC-NINT, NRC is committed to hire 150 new researchers and provide training for 275 post-graduate students by 2005. Over the coming year, NRC will hire close to 40 scientific and administrative personnel.

In addition to new research positions being filled in Atlantic Canada and in Montréal, NRC launched the *New Horizons – New Opportunities* Program to attract and retain 50 leading researchers within the next five years. This new recruitment initiative specifically targets outstanding young scientists and engineers with the potential to become world leaders in their field,

as well as renowned established researchers. Ensuring that in years to come Canada has enough highly qualified people with the skills for a vibrant, knowledge-based economy is part of the

The NRC Employment Philosophy:

- Recruit and retain outstanding people;
- Give them the opportunity to grow professionally, to utilize their strengths and to deliver to the maximum of their capabilities;
- Reward them based on their level of professional development and their level of productivity; and
- Create a respectful partnership with them based on trust and understanding.

Government of Canada's series of national goals for a more competitive economy, more jobs and economic growth over the next ten years. It aims to entice young achievers, as well as seasoned researchers and scientists to NRC's world-class facilities.

As part of its strategic plan, NRC-IRAP will go forward with its People Transition Plan, where all non-NRC ITAs will be transferred to NRC. Once the transition is completed, NRC-IRAP ITAs will be deployed to better offer their combined technical knowledge to the benefit of every region in Canada.

In 2003-2004, the Human Resources Management Steering Committee and its subcommittees will continue to work on strengthening the shared responsibility for human resources management by aligning the goals of its subcommittees with the goals of the **Employment Philosophy**.

Many institutes, programs and branches of NRC have completed their **Employment Philosophy surveys** and NRC's Human Resources Branch will work with management of the institutes, programs and branches on action plans to address the issues highlighted in each survey. In addition, the Human Resources Branch will undertake a review of the hiring and classification processes and streamline them to allow for more flexibility.

Leading-edge research facilities and equipment

The development and maintenance of leading-edge research facilities, equipment and practices is fundamental to attracting the best research talent and to achieving excellence and creativity in research and innovation, as well as providing a competitive edge to companies. For the planning period, NRC plans to invest more than \$150 million in new facilities and equipment in order to maintain the government's infrastructure investment up to date. More notably, these investments are:

- the **NRC-IAR Aeronautics Research Infrastructure**, which includes the **NRC Aerospace Manufacturing Technology Centre** in Montréal and the **Gas Turbine Environmental Research Centre** in Ottawa. These facilities represent an investment of more than \$60 million for the aerospace manufacturing sector.
- the **NRC-IMI Aluminium Technology Centre** on the campus of the Université du Québec à Chicoutimi, a total investment of \$34.4 million to support the development of a value-added aluminium cluster in the region;
- the **Canadian Photonics Fabrication Centre** in Ottawa which represents an investment of \$19 million by NRC to offer SMEs access to prototyping and foundry facilities; and
- the **NRC-IMD** and **NRC-IMB Industry Partnership Facilities**, an investment of \$11.2 million, to assist start-up companies and local SME in the emerging ocean and marine engineering and life sciences clusters, in St John's (Newfoundland) and Halifax (Nova Scotia), respectively.

An outstanding place to work

NRC is committed to providing a work environment that enhances the creativity of employees. Beyond developing and maintaining leading-edge research facilities, equipment and practices, NRC institutes, programs and branches are engaged in a number of activities promoting an outstanding work environment.

In April 2001, NRC launched its Artist-in-Residence for Research program, or AIREs, in collaboration with the Canada Council for the Arts. The Program, designed as a two-year pilot, strives to encourage collaborations between art and science and the use of S&T in the arts. The Research grants will be awarded to professional artists to work at NRC's research institutes. The first two grant recipients have been announced and are expected to start their projects in 2003. (For more details on the program, please visit <http://www.canadacouncil.ca/grants/interarts/ccsh01-e.asp>)

Managing to Realize our Vision 2006

For the Report on Plans and Priorities, NRC reports on its plans and expected results for Government-on-Line, Modern Comptrollership and Sustainable Development in Operations in *Appendix B: Government-Wide and Horizontal Initiatives*. (See page 47.)

Audit and Evaluation Plans

Using the supplementary resources available due to the new policies on audit and evaluation, NRC has been able to complete work in the areas of internal audit and program evaluation. For the planning period, internal audit and program evaluation will conduct the following studies:

- Evaluation of the Institute for Chemical Process and Environmental Technology;
- Implementation review of NRC-MTG Strategy;
- Formative assessment of the Atlantic Initiative;
- Audit of SIGMA Reporting;
- Audit of the Facilities and Equipment; and
- Audit of Integrated Risk Management.

Results of the previous audits and evaluations are now available on NRC's web site at http://www.nrc-cnrc.gc.ca/aboutUs/audit_e.html

NRC Planning Network

Created in December 2001, the objective of the NRC Planning Network, which brings together research directors and senior administrators from across NRC, is to derive more value from the planning and performance management activities within the organization. Over the past year, the Planning Network has developed common guidelines for strategic planning within NRC and worked on the development of a results-based performance management framework aligned with the *Vision 2006*. Over the coming year, the Network will focus on issues associated with technology roadmapping and foresight, competitive technical intelligence, strategic plan implementation, performance management tools and strategies for streamlining the planning and reporting system within NRC.

Section 4 Organization

Overview of NRC

The National Research Council Canada (NRC) is the Government of Canada's largest science and technology agency, a premier vehicle for innovation and a leading resource for science, research and technology development. NRC is a national organization with approximately 3,600 employees and 1,200 guest workers. In addition, it is an integral part of the Industry Portfolio and the Canadian and international S&T community.

Mandate

The *National Research Council Act* and the *Weights and Measures Act* set out the legislative framework that guides NRC.

Under the *National Research Council Act*, NRC is responsible for:

- undertaking, assisting or promoting scientific and industrial research in different fields of importance to Canada;
- investigating standards and methods of measurement;
- working on the standardization and certification of scientific and technical apparatus and instruments and materials used or usable by Canadian industry;
- operating and administering any astronomical observatories established or maintained by the Government of Canada;
- administering NRC's research and development activities, including grants and contributions used to support a number of international activities;
- providing vital scientific and technological services to the research and industrial communities; and
- establishing, operating and maintaining a national science library and publishing, selling and otherwise distributing scientific and technical information.

Under the *Weights and Measures Act*, NRC has a specific mandate relating to "the investigation and determination of standards and methods of measurements including length, volume, weight, mass, capacity, time, heat, light, electricity, magnetism, and the investigation and determination of physical constants and the fundamental properties of matter."

Please consult <http://lois.justice.gc.ca/en/> for more details about the NRC's legislative framework.

Agency Organization

NRC is divided into three business lines, which provide a balance between conducting research and development, offering technical and innovation support services to industry and the public, and supporting the organization with corporate services. The accountability structure (or organizational chart) of NRC is presented on page 39.

Crosswalk between NRC's Strategic Outcomes and Business Lines

Table 6: A Crosswalk between NRC's Strategic Outcomes and Business Lines					
Business Lines	Strategic Outcomes				
	Excellence and Leadership in R&D	Technology Clusters	Value for Canada	Global Reach	Outstanding People - Outstanding Employer
Research and Technology Innovation	√	√	√	√	√
Support for Innovation and the National Science and Technology Infrastructure	√	√	√	√	√
Program Management		√	√	√	√

Business Line 1 – Research and Technology Innovation

Objective

To achieve sustained knowledge-based economic and social growth in Canada through research and development and innovation in key areas.

Description

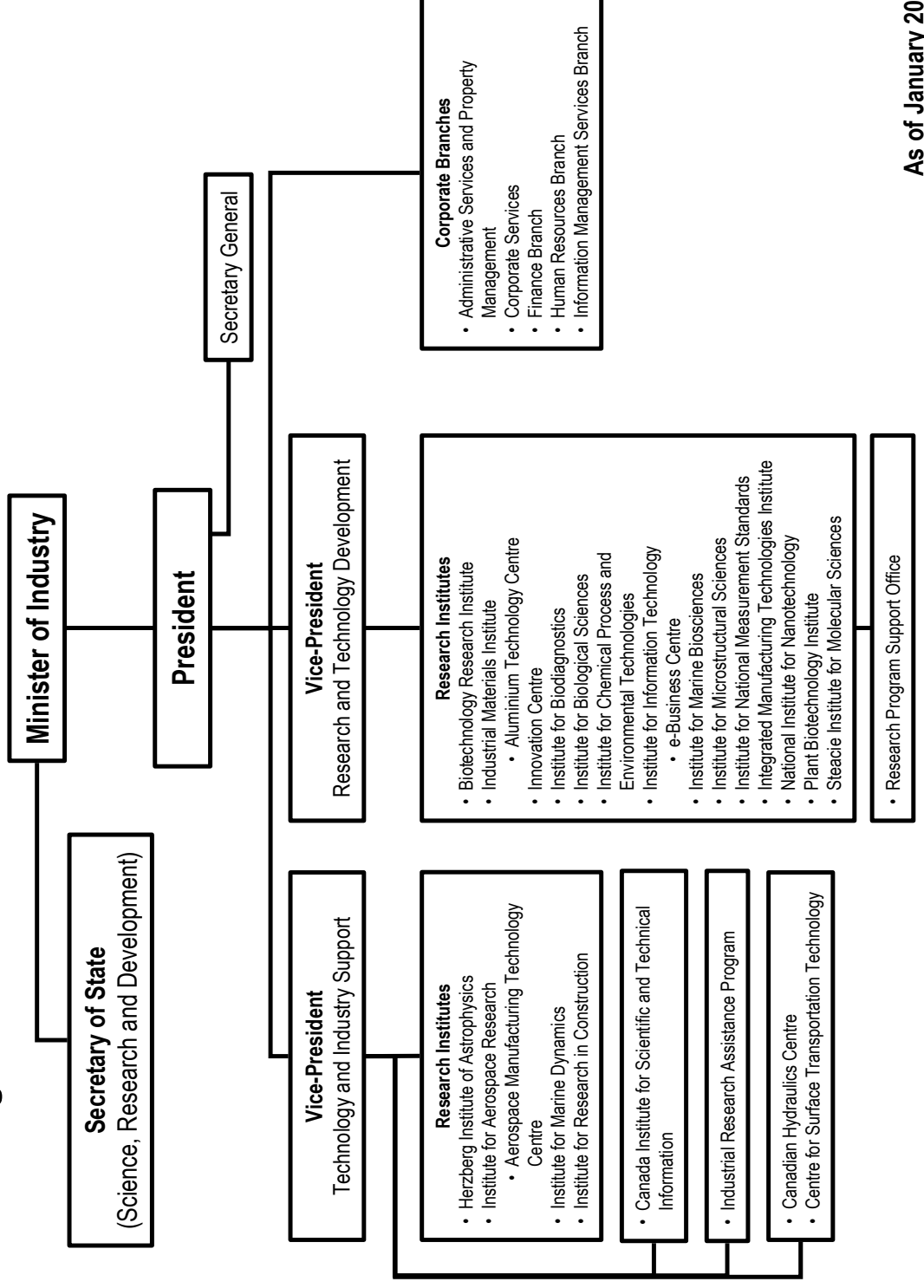
The business line includes the research programs, technology development initiatives and the management of national science and engineering facilities along with research and collaborations with firms, universities and public institutions. These efforts all focus on key technological and industrial areas of Canada's economy where NRC has specific roles and recognized competencies, and where it has the ability to have an impact.

Associated institutes

- **Aerospace Technologies** – Institute for Aerospace Research (Aerospace Manufacturing Technology Centre)
- **Astronomy and Astrophysics** – Herzberg Institute of Astrophysics
- **Biotechnology** – Biotechnology Research Institute, Institute for Biodiagnostics, Institute for Biological Sciences, Institute for Marine Biosciences and Plant Biotechnology Institute
- **Construction** – Institute for Research in Construction
- **Information and Communications Technologies** – Institute for Microstructural Sciences and Institute for Information Technology
- **Manufacturing Technologies** – Industrial Materials Institute (Aluminium Technology Centre), Institute for Chemical Process and Environmental Technologies, Integrated Manufacturing Technologies Institute and Innovation Centre
- **Measurement Standards** – Institute for National Measurement Standards
- **Molecular Science** – Steacie Institute for Molecular Sciences
- **Nanotechnology** – National Institute for Nanotechnology
- **Ocean Engineering and Marine Industries** – Institute for Marine Dynamics

(millions of dollars)	Forecast Spending 2002-2003	Planned Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006
Research and Technology Innovation				
Net Business Line Spending	368.4	410.6	406.6	360.6
Full Time Equivalents	2,392	2,443	2,443	2,443

Organizational Chart of the National Research Council Canada



Business Line 2 – Support for Innovation and the National Science and Technology Infrastructure

Objective

- To improve the innovative capability of Canadian firms through the provision of integrated and co-ordinated technological and financial assistance, information and access to other relevant resources; and
- To stimulate wealth creation for Canada through technological assistance, information and access to other relevant resources.

Description

The Support for Innovation and the National Science and Technology Infrastructure business line reinforces NRC's role as a major R&D participant within the larger Canadian science and technology infrastructure. This business line encompasses the dissemination of scientific, technical and medical information and the provision of innovation assistance to Canadian small and medium sized enterprises. NRC also maintains key engineering and technology-based facilities to support specific industrial sectors of the economy.

Associated programs and centres

- **Innovation Assistance to Firms** – Industrial Research Assistance Program
- **Scientific, Medical and Technical Information** – Canada Institute for Scientific and Technical Information
- **Technology Centres** – Canadian Hydraulics Centre and Centre for Surface Transportation Technology

(millions of dollars)	Forecast Spending 2002-2003	Planned Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006
Support for Innovation and the National S&T Infrastructure				
Net Business Line Spending	164.1	162.1	173.0	169.1
Full Time Equivalents	579	591	591	591

Business Line 3 – Program Management

Objective

To provide efficient, client-focused services, which enhance NRC's effectiveness as an integrated, dynamic science and technology organization.

Description

The business line provides policy, program advice and executive support for the coordination and direction of NRC's operations and its governing Council. It also supports and enables effective and efficient management of NRC's resources through its specialization in finance, information management, human resources, administrative services and property management and corporate services.

Associated corporate branches

- **Administrative Services and Property Management**
- **Corporate Services**
- **Finance Branch**
- **Human Resources Branch**
- **Information Management Services Branch**

(millions of dollars)	Forecast Spending 2002-2003	Planned Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006
Program Management				
Net Business Line Spending	67.5	73.1	70.3	66.6
Full Time Equivalents	597	609	609	609

Agency Planned Spending

AGENCY PLANNED SPENDING (MILLIONS OF DOLLARS)				
	Forecast Spending 2002-2003 *	Planned Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006
Research and Technology Innovation	368.4	410.6	406.6	360.6
Support for Innovation and the National Science and Technology Infrastructure Program Management	164.1 67.5	162.1 73.1	173.0 70.3	169.1 66.6
Budgetary Main Estimates (gross)	600.0	645.8	649.9	596.3
Non-Budgetary Main Estimates (gross)	0.0	0.0	0.0	0.0
Less: <i>Respendable Revenue</i>	0.0	0.0	0.0	0.0
Total Main Estimates	600.0	645.8	649.9	596.3
<i>Adjustments **</i>	83.1	39.9	49.2	46.5
Net Planned Spending	683.1	685.7	699.1	642.8
Less: Spending of Revenues Pursuant to section 5.1 (e) of the <i>NRC Act</i> .	73.5	76.0	76.6	78.1
Plus: Cost of services received without charges	15.3	15.0	15.2	15.2
Net Cost of the Department	625.0	624.8	637.7	579.9
Full Time Equivalents	3,568	3,643	3,643	3,643

Notes:

Due to rounding, figures may not add to total shown.

* Reflects best forecast of total planned spending to the end of the fiscal year.

** Adjustments are to accommodate approvals obtained since the Main Estimates and are to include Budget initiatives, Supplementary Estimates, etc.

Appendix A

Financial Information

Summary of Financial Tables

Table 1 – Summary of Capital Spending by Business Line

Table 2 – Details on Major Capital Projects Spending

Table 3 – Summary of Transfer Payments

Table 4 –Source of Respendable Revenue

Table 5 – Net Cost of Program for the Estimate Year

Table 1 – Summary of Capital Spending by Business Lines

CAPITAL SPENDING BY BUSINESS LINE (MILLIONS OF DOLLARS)				
Business Lines	Forecast Spending 2002-2003	Planned Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006
Research and Technology Innovation	92.2	64.9	58.3	47.1
Support for Innovation and the National Science and Technology Infrastructure	0.0	0.0	0.0	0.0
Program Management	6.3	7.6	6.4	5.8
Total Capital Spending	98.4	72.5	64.7	52.9

Table 2 – Details on Major Capital Projects Spending

CAPITAL PROJECTS BY BUSINESS LINE (MILLIONS OF DOLLARS)						
Business Lines	Current Estimated Total Cost	Forecast Spending to March 31, 2003	Planned Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006	Future Years' Requirement
Research and Technology Innovation						
<i>Newfoundland and Labrador</i>						
Renovations and Additions to NRC-IMD (S-EPA)	6.4	4.2	2.2			
<i>Nova Scotia</i>						
Construction of the Industry Partnership Facility (DA)	4.8	2.2	2.6			
Brain Repair Centre – 4T Imaging Facility (DA)	4.2	3.8	0.4			
<i>New Brunswick</i>						
Construction of the NRC-IIT E-Business Centre (S-EPA)	9.1	7.8	1.3			
<i>Quebec</i>						
NRC Aerospace Manufacturing Technology Centre (S-EPA)	34.1	16.6	11.5	6.0		
Nanomaterials Processing Facility (DA)	1.4	1.0	0.4			
NRC Aluminium Technology Centre (S-EPA)	34.4	19.5	6.0	5.0	3.9	
<i>Ontario</i>						
NRC-IAR Gas Turbine Environmental Research Centre (S-EPA)	27.5	24.1	3.4			
Natural Health Products and Functional Foods – Emerging Metrology Needs (DA)	1.7	1.0	0.7			
Concrete Research at the Nanoscale (DA)	1.2	0.7	0.5			
High-Load Low Reynolds Number Testing Facility (DA)	1.2	0.2	0.5	0.5		
A World-Leading NMR Centre (DA)	3.4	1.4	2.0			
Construction of the Canadian Photonics Fabrication Centre (S-EPA)	19.0	7.0	12.0			
<i>British Columbia</i>						
Canada-France-Hawaii Telescope Legacy Survey and the Canadian Virtual Observatory (DA)	1.3	1.0	0.3			
Move of NRC-IC (I-PPA)	15.0		1.4	8.2	5.5	
Program Management						
<i>Ontario</i>						
Asbestos Removal – Building M-58 (DA)	1.6	1.4			0.2	

Table 3 – Summary of Transfer Payments

TRANSFER PAYMENTS BY BUSINESS LINE (MILLIONS OF DOLLARS)				
Business Lines	Forecast Spending 2002-2003	Planned Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006
GRANTS				
Research and Technology Innovation	0.2	0.3	0.0	0.0
Program Management	1.0	1.0	1.0	1.0
Total Grants	1.2	1.3	1.0	1.0
CONTRIBUTIONS				
Research and Technology Innovation ¹	49.0	45.7	45.5	24.8
Support for Innovation and the National Science and Technology Infrastructure ²	97.0	110.0	118.4	118.4
Total Contributions	146.0	155.7	163.9	143.2
Total Transfer Payments	147.2	157.0	164.9	144.2

Notes:

- (1) **TRIUMF:** Located on the campus of the University of British Columbia, it is Canada's national laboratory for research in particle and nuclear physics. It is managed as a joint venture by a consortium of universities (Universities of Alberta, British Columbia, Carleton, Simon Fraser and Victoria) and operated under a contribution from the Government of Canada administered by NRC. An Advisory Committee on TRIUMF (ACOT) monitors TRIUMF's overall scientific program and ensures that all program initiatives are of an appropriate scientific quality, while an Agency Committee on TRIUMF (ACT) oversees the federal investment, with a particular focus on financial and commercialization matters. A results-based management and accountability framework incorporating performance indicators and expected results and outcomes has been prepared for TRIUMF for the current 2000-2005 funding period. (Please visit NRC's 2001-2002 Departmental Performance Report on-line at http://www.tbs-sct.gc.ca/rma/dpr/01-02/NRC/NRC0102dpr_e.asp for more details on TRIUMF's performance).

International telescopes: NRC, through the Herzberg Institute of Astrophysics (NRC-HIA), supports the construction and operation of international telescopes in order to ensure that Canadian researchers and students (spanning several professional disciplines) have access to sophisticated, cutting edge astronomical facilities. NRC currently supports the Canada-France-Hawaii Telescope (Hawaii), the James Clerk Maxwell Telescope (Hawaii) and the Gemini Telescopes (twin facilities in Hawaii and Chile).

- (2) **Industrial Research Assistance Program (NRC-IRAP):** Through expert advice and financial assistance, NRC-IRAP stimulates the innovative capacities of some 12,000 SMEs each year. It has been demonstrated that NRC-IRAP helps SMEs to (1) acquire new technical knowledge and skills, (2) enhance linkages with experts, (3) improve processes, and (4) increase innovation, sales and jobs. In 2001-2002, the total NRC-IRAP level of activity was \$149.65 million; including \$97.8 million in direct contributions to 2,841 SMEs for 3,271 innovation capacity building projects. Of this \$97.8 million, \$27.8 million was delivered through the IRAP-TPC program to assist in pre-commercialization projects.

Table 4 – Source of Respendable Revenue

SPENDING OF REVENUES PURSUANT TO THE <i>NRC ACT</i> (MILLIONS OF DOLLARS)				
Business Lines	Forecast Revenue 2002-2003	Planned Revenue 2003-2004	Planned Revenue 2004-2005	Planned Revenue 2005-2006
Research and Technology Innovation				
Fee-for-Service	27.0	26.1	25.1	26.1
Rentals	2.1	1.9	2.0	2.2
Royalties	6.3	5.8	7.1	7.2
Publications	2.0	2.0	2.9	3.9
Others	0.5	0.7	0.5	1.5
Support for Innovation and the National Science and Technology Infrastructure				
Fee-for-Service	5.8	6.2	6.9	7.4
Royalties	0.1	0.1	0.1	0.1
Publications	26.4	26.0	26.6	27.1
Others		0.2	0.2	0.2
Program Management				
Fee-for-Service	0.8	1.0	0.9	1.0
Rentals	0.5	0.5	0.5	0.5
Others	1.9	5.5	3.9	1.0
Total Respendable Revenues	73.5	76.0	76.6	78.1

Notes:

Due to rounding, figures may not add to totals shown.

Table 5 – Net Cost of Program for the Estimate Year

(MILLIONS OF DOLLARS)	
	Total
Planned Spending (Total Main Estimates plus Adjustments as per the Planning Spending table)	685.7
Plus:	
<i>Services Received without Charge</i>	
Employer's share of health and employment insurance premiums paid by the Treasury Board Secretariat (excluding revolving funds)	14.5
Employee compensation under <i>Workers' Compensation Act</i> paid by Human Resources Development Canada	0.3
Salary and associated expenditures of legal services provided by the Department of Justice Canada	0.2
Accommodations – Public Works and Government Services Canada	0.0
	15.0
Total Cost of Program	700.7
Less:	
<i>Spending of revenues pursuant to the NRC Act</i>	76.0
2003-2004 Net Cost of Program	624.8

Appendix B

Government-wide and Horizontal Initiatives

Government-wide Initiatives

Canada's *Innovation Strategy*

As the Government of Canada's largest S&T agency, NRC has been a strong supporter of and participant in the development of a national strategy for innovation in Canada. In July 2002, NRC published the Council Response to the Innovation Strategy, in which it outlines key actions to address the challenges outlined in *Achieving Excellence*. The *National Summit on Innovation and Learning*, held in November 2002, is seen by NRC as a major milestone in the development of an action plan to move Canada to among the top five nations in the world in R&D performance. NRC will be an active participant in the delivery of the upcoming action plan and will ensure that its priorities are well aligned to the Canadian Strategy.

Sustainable Development

As a Schedule II (*Financial Administration Act*) departmental corporation, NRC is not subject to the 1995 amendments to the *Auditor General Act* requiring the preparation of a Sustainable Development Strategy (SDS). However, NRC has an Environmental Management Policy to ensure that its operations contribute to sustainable development. NRC fosters the integration of sustainable development strategies and practices across Canada and in the innovation processes of Canadian SMEs.

Sustainable Development in Operations

NRC continues to modify existing buildings to reduce energy consumption and save money. To reduce greenhouse gas emissions and contribute to environmentally sound operations, NRC will replace air chillers and air handling units and retrofit several buildings with efficient light fixtures that use 30% less energy. The *Energy at NRC* Web site will keep all NRC personnel updated on expected plans and actual results, please visit http://energy-econergie.nrc-cnrc.gc.ca/main_e.html.

Government-On-Line (GoL)

NRC will develop and implement a Common Look and Feel strategy for its Intranet sites by December 31, 2003. In 2003-2004, NRC is planning to contribute or update its contribution to the following gateways: Science and Technology; Environment, Fisheries and Agriculture; Innovation, Research and Development Technology; Doing Business in Canada and Canada and the World. NRC will also evaluate its on-line presence, information and services to determine that NRC provides enhanced access to citizen-centred, integrated services, anytime, anywhere and in the language of their choice.

Modern Comptrollership (Modern Management Practices – MMP)

After the completion of the MMP Capacity Assessment, a Strategy and Action Plan will be integrated with, and build on, NRC's existing and planned management initiatives with implementation starting in 2003-2004. NRC is examining possibilities for working with partners in other departments and agencies on special projects in areas such as risk management and performance management, especially as they relate to an S&T environment.

Collective Initiatives

Industry Portfolio

NRC reports directly to the Parliament of Canada through the Minister of Industry and is one of fifteen departments and agencies that make up the Industry Portfolio. Together these organizations are uniquely positioned to advance the Government's agenda in building national innovative capacity and to help Canada become one of the top five industrialized nations in R&D.

Through partnerships and projects, NRC has worked closely with Industry Portfolio partners over the years to leverage complementary resources and exploit synergies. During 2001, the members of the Industry Portfolio agreed upon four priority areas of cooperation for the future:

- **Innovation** – stimulating the creation and use of knowledge to benefit all Canadians;
- **Business development** – supporting the creation and growth of businesses (primarily SMEs) and industries;
- **Sustainable communities** – promoting inclusive economic growth in rural, urban and remote communities across Canada; and
- **Marketplace** - ensuring fair, efficient and competitive rules, standards and ways of operating.

Over the planning period, NRC will collaborate with its Portfolio partners in developing strategies and approaches to advance these four priorities.

Federal Strategies and Initiatives

Whether it is NRC's unique and multidisciplinary research portfolio or its technology cluster model, NRC is a welcome partner in many S&T horizontal and government-wide initiatives. *Table 7* demonstrates NRC participation in Federal Strategies and Initiatives for which NRC and its partners have been granted funds specifically for realization of these initiatives.

NRC is involved in:

- Atlantic Investment Partnership;
- Aerospace Technology Infrastructure Initiative;
- CBRN Research and Technology Initiative; and
- Genomics Research Initiative

Table 7: Federal Strategies and Initiatives – NRC Participation

COLLECTIVE INITIATIVES	STRATEGIC OUTCOME (KEY RESULT COMMITMENT)	LEAD DEPARTMENT	RESOURCES ALLOCATIONS (MILLIONS OF DOLLARS)	EXPECTED BENEFIT AND/OR RESULTS FOR CANADIANS
<i>Atlantic Investment Partnership</i>	Fostering technology clusters that develop the innovative capacity and socio-economic potential of Canada's communities.	ACOA	NRC was allocated \$110 million over five years, starting in 2000-2001, from the \$700 million Atlantic Investment Partnership for its Atlantic Canada Innovation Initiative.	<ul style="list-style-type: none"> ■ Create a globally competitive research and technology base for cluster development at the community level; ■ Foster community leadership, champions and knowledge-based strategies; ■ Leverage funding and new investment in the cluster with stakeholders; ■ Stimulate the emergence of new firms, jobs, exports and investment growth.
<i>Aerospace Technology Infrastructure Initiative</i>	Provide the technology infrastructure needed to ensure the long-term international competitiveness of the Canadian aerospace industry (including access to national facilities, and leadership and direction in technology transition).	CED	NRC was allocated \$43.4 million over the five-year period 2000-2001 to 2004-2005 for the development and construction of facilities and the establishment of new research programs in Montréal and Ottawa. CED is contributing \$25 million over the same period toward the capital costs associated with the construction AMTC in Montréal.	<ul style="list-style-type: none"> ■ Industrial and economic development: increasing and leveraging investments in Canadian aerospace technology and increasing capacity of Canadian firms; ■ Regional development: developing and transferring technology within local communities; ■ Advancement of knowledge: development, transfer and growth of knowledge and highly qualified personnel; ■ Environmental and safety improvements: improve environmental, safety and quality performance of aerospace industry.
<i>CBRN Research and Technology Initiative</i>	Strengthen Canada's preparedness for prevention of, and response to, a CBRN terrorist attack by fostering new investments in research and technology that will generate knowledge and technology, and support their application, while harnessing existing capabilities.	DND (DRDC)	Launched in May 2002, as a response to the events of 9/11, DND (DRDC) has been allocated \$170 million to help Canada respond to CBRN incidents through the CBRN Research and Technology Initiative (CRTI). NRC is the lead on one project and participates in three others.	<ul style="list-style-type: none"> ■ Create clusters of federal labs as elements of a federal laboratory response network that will build S&T capacity to address the highest risk terrorist attack scenarios; ■ Create a fund to build capability in critical areas, particularly those identified in the scenarios that address biological and radiological attack; ■ Accelerate technology into the hands of the first responders community and other operational authorities; and ■ Provide funds to those areas where national S&T capacity is deficient owing to obsolete equipment, dated facilities and inadequate scientific teams.
<i>Genomics Research Initiative</i>	Enhance the quality of life of Canadians in terms of health, safety, the environment and social and economic development by positioning Canada as a responsible world leader in biotechnology.	NRC	From 1999-2000 to 2001-2002, a \$55 million genomics research initiative was developed through the Canadian Biotechnology Strategy. In 2002-2003, \$59 million were allocated by the Treasury Board to pursue this initiative. NRC received \$17 million in 1999-2000 and \$18 million in 2002-2003.	<ul style="list-style-type: none"> ■ <i>Stewardship</i>: increased dissemination of genomics information; impact in terms of value-added and influence in technology identification, adoption, and development; establishment of critical mass and strengthening of national genomics program through excellence in federal research programs ■ <i>Economic benefits</i>: increased business development; improved management practices development; improved technical and economic performance of genomics clients and target population ■ <i>Citizenship engagement</i>: improved awareness and understanding of genomics research and its potential impacts; stakeholder and/or client community recognition and support of genomics organizations and their product and/or services.

Appendix C

Management & Legislative Information

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NRC Legislation

The establishment, duties and powers of NRC are set out in the *National Research Council Act*, R.S.C. 1985, c. N-15

NRC has responsibilities and duties relating to the calibration and certification of standards of measurement under the *Weights and Measures Act*, R.S.C. 1985, c. W-6

Appendix D

NRC Strategic Outcomes - Linkages

Linkages between NRC Strategic Outcomes and TBS' Canada's Performance

Economic Opportunities and Innovation in Canada Theme

As Canada's foremost multidisciplinary R&D agency, NRC falls under the *economic opportunities and innovation in Canada* theme of the Canada's Performance 2002 Annual Report to Parliament and the two societal indicators *innovation* and *educational attainment*. NRC is aligned with the innovation societal indicator with its 18 research institutes, two technology centres, the Industrial Research Assistance Program (NRC-IRAP) and the Canada Institute for Scientific and Technical Information (NRC-CISTI). NRC is also aligned with educational attainment as it helps to develop skilled workers through undergraduate, graduate and post-graduate training programs.

Societal Indicator: Innovation

With the Government of Canada's commitment in the *Speech from the Throne* (January 2001) for Canada to become one of the top five R&D performers in the world and the release of *Canada's Innovation Strategy*, NRC is now more committed than ever to pursuing its goals of fostering Canada's innovative capabilities through scientific research and technological development and innovation support programs. NRC's new five-year plan, *Vision 2006*, focuses on innovation; four of the five strategic pillars of *Vision 2006* are focused on innovation.

Related NRC's Strategic Outcomes:

- *Excellence and leadership in research and development* – By 2006, NRC will assume a leadership position in at least three new vital domains of scientific and engineering research needed for Canada to meet national challenges and capitalize on the opportunities of a global knowledge economy.
- *Technology clusters* – By 2006, NRC will contribute to the development of new, sustainable and competitive innovation clusters in at least ten Canadian communities.
- *Value for Canada* – By 2006, NRC will be recognized by its partners and government stakeholders as Canada's leading developer of new research and technology-based enterprises, and respected for its innovative S&T commercialization practices.
- *Global Reach* – By 2006, NRC will be recognized by its stakeholders for its contributions to a more effective Canadian innovation system that assures access to international facilities and research networks, provides opportunities for Canadian firms, and builds new research and technology alliances.

Related NRC Programs and Initiatives:

- 18 research institutes, two technology centres (See Appendix E for a complete list of NRC Research Institutes and Technology Centres.);
- Special Interest Groups

- Entrepreneurship Program;
- Atlantic Innovation Partnership;
- Canada Institute for Scientific and Technical Information
- Industrial Research Assistance Program; and
- Canadian Technology Network.

Societal Indicator: Educational attainment

One of the goals set forth in *Canada's Innovation Strategy* is to develop the most skilled and talented labour force in the world. Since its inception, NRC has provided training opportunities to many of Canada's young scientists and engineers. Close to 900 students, each year, come to work with NRC research teams in our world-class facilities. Also many of NRC's scientists, researchers and engineers have received appointments as adjunct professors in Canadian universities.

Related NRC's Strategic Outcomes:

- *Outstanding People – Outstanding Employer* – By 2006, NRC will be regarded by staff and their peers as a major innovator in human resources management, as a place where outstanding people are encouraged and are able to make outstanding contributions to Canada, and as an outstanding employer offering a great place to work.
- *Excellence and leadership in research and development* – By 2006, NRC will assume a leadership position in at least three new vital domains of scientific and engineering research needed for Canada to meet national challenges and capitalize on the opportunities of a global knowledge economy.

Related NRC Programs and Initiatives:

- New Horizons – New Opportunities Program
- IRAP's Youth Internship Program;
- Research Associate Program;
- Women in Engineering and Science Program;
- Program to Enhance the Canadian Science and Technology Capacity (Supplement to Scholarships Recipients and Herzberg Memorial Prize and Fellowship); and
- NRC Post-doctoral Fellowship Program.

Appendix F

NRC Institutes, Branches and Centres

Aerospace

Institute for Aerospace Research (NRC-IAR) - Ottawa, Ontario and Montréal, Quebec

Director General: David Simpson

As Canada's national aerospace laboratory, the NRC Institute for Aerospace Research (NRC-IAR) undertakes and promotes R&D in support of the Canadian aerospace community, in matters affecting the design, manufacture, performance, use and safety of aerospace vehicles. NRC-IAR serves the industrial needs of airframe manufacturers, avionics manufacturers and aircraft operators. Aerospace manufacturing requires fundamental design assurances for its structural parts that encompass fail-safe and damage-tolerance concepts. NRC-IAR research and testing help clients to meet these standards and satisfy airworthiness and certification requirements.

General Inquiries: (613) 993-0141

<http://iar-ira.nrc-cnrc.gc.ca/>

Astrophysics

Herzberg Institute of Astrophysics (NRC-HIA) – Victoria and Penticton, British Columbia

Director General: Gregory G. Fahlman

The NRC Herzberg Institute of Astrophysics (NRC-HIA) provides first-class research facilities in observational astronomy to the national research community. Most of its activities are conducted in the context of major international agreements and partnerships. NRC-HIA operates astronomical observatories of the Government of Canada in Victoria and Penticton (British Columbia), participates in four major international observatories in Hawaii and Chile (Canada-France-Hawaii Telescope, James Clerk Maxwell Telescope and the Gemini Telescopes); assigns observing time to any scientists in Canada and supports space astronomy mission.

General Inquiries: (250) 363-0040

<http://hia-ihp.nrc-cnrc.gc.ca/>

Biotechnology Group

Biotechnology Research Institute (NRC-BRI) - Montréal, Quebec

Director General: Michel Desrochers

The NRC Biotechnology Research Institute (NRC-BRI) promotes, assists and performs leading edge R&D in biochemical engineering, molecular biology and genomics, closely linked to the needs of industries in the health and environmental sectors. NRC-BRI is a critical locus of the biotechnology R&D cluster of enterprises in the Greater Montréal region. To support the industry, NRC-BRI offers an industry partnership wing of lab space, corporate offices and an environmental pilot plant to start-up and existing firms.

General Inquiries: (514) 496-6100

<http://www.bri-irb.nrc-cnrc.gc.ca/>

Institute for Biodiagnostics (NRC-IBD) - Winnipeg, Manitoba

Director General: Ian Smith

The NRC Institute for Biodiagnostics (NRC-IBD) performs world-class research in non-invasive medical diagnostics and transfers this knowledge to the commercial sector. The results make a real difference to health influencing diagnostics, treatment and prognosis.

General Inquiries: (204) 983-7692

<http://www.ibd.nrc-cnrc.gc.ca/>

Institute for Biological Sciences (NRC-IBS) - Ottawa, Ontario

Director General: Gabrielle Adams

The NRC Institute for Biological Sciences (NRC-IBS) is a team of life sciences researchers dedicated to unearthing the next breakthrough discoveries and technologies in neurobiology and immunochemistry. NRC-IBS is focussed on R&D associated with neurodegenerative diseases, infectious diseases, cancer vaccines, immunotherapeutics and bioproducts.

General Inquiries: (613) 993-5975

<http://ibs-isb.nrc-cnrc.gc.ca>

Institute for Marine Biosciences (NRC-IMB) - Halifax, Nova Scotia

Director General: George Iwama

The NRC Institute for Marine Biosciences (NRC-IMB) conducts research in the life sciences, with an overall orientation towards marine biotechnology. NRC-IMB expertise is in the four following areas: aquaculture biotechnology, marine chemistry, cell and molecular biology and genomic technology. NRC-IMB operates and manages the Canadian Bioinformatics Resource (CBR), a national facility providing access to biotechnology-related databases and bioinformatics software tools.

General Inquiries: (902) 426-6829

<http://imb-ibm.nrc-cnrc.gc.ca/>

Plant Biotechnology Institute (NRC-PBI) - Saskatoon, Saskatchewan

Director General: Kutty Kartha

The NRC Plant Biotechnology Institute (NRC-PBI) performs, assists and promotes strategic research in plant biotechnology (strategic and enabling technologies, plant production modification and plant performance) to improve and diversify Canadian industry and strengthen Canada's competitive position in the global economy. NRC-PBI is a leader in the metabolic modification of oilseeds to increase oil content and to create specialty plant oils for new markets. Similar research is altering wheat starch for novel uses and to meet new international markets. Investigation of metabolic pathways has also led to a significant reduction in anti-nutritional compounds in common commercial crops. NRC-PBI also serves as a catalyst for economic growth and development and contributed to the emergence of Saskatoon's foremost agriculture biotechnology cluster.

General Inquiries: (306) 975-5568

<http://pbi-ibp.nrc-cnrc.gc.ca/>

Construction

Institute for Research in Construction (NRC-IRC) - Ottawa, Ontario

Director General: Sherif Barakat

The NRC Institute for Research in Construction (NRC-IRC) is Canada's foremost centre for construction technologies. NRC-IRC develops and maintains core competencies and the knowledge base critical to Canadian construction industry needs; supports the development, commercialization and implementation of leading technologies; and fosters the provision of a safe and sustainable built environment by developing building codes and standards.

General Inquiries: (613) 993-2443

<http://irc.nrc-cnrc.gc.ca/>

Information and Communications Technology Group

Institute for Information Technology (NRC-IIT) - Ottawa, Ontario and Fredericton, New Brunswick

Director General: Andrew Woodsworth

The NRC Institute for Information Technology (NRC-IIT) is dedicated to R&D in software and systems technologies. NRC-IIT is a key player in R&D collaborations and partnerships in information and communications technologies with business, universities and government agencies in Canada and around the world. In June 2000, NRC-IIT expanded its activities in Atlantic Canada with the establishment of a new e-business research program across New Brunswick and in Sydney (Nova Scotia).

General Inquiries: (613) 993-3320

<http://iit-iti.nrc-cnrc.gc.ca/>

Institute for Microstructural Sciences (NRC-IMS) - Ottawa, Ontario

Director General: Richard Normandin

The NRC Institute for Microstructural Sciences (NRC-IMS) provides leadership, in collaboration with Canadian industry and universities, in the development of the strategic base for information technology; that is, in the development of enabling technologies related to future hardware requirements for information processing, transmission acquisition and display.

General Inquiries: (613) 993-4583

<http://ims-ism.nrc-cnrc.gc.ca>

Manufacturing Technologies Group

Innovation Centre - Vancouver, British Columbia

Director General: Maja Veljkovic

The NRC Innovation Centre develops core competencies relevant to the long-term strategic technology needs of Canadian industry, with particular emphasis on integration with other players in the B.C. innovation community. The *Fuel Cell Technology Centre* (FCTC) established at the Innovation Centre acts as an R&D platform for the National Fuel Cell Initiative. The FCTC will support validation/testing of fuel cell component and sub-component projects conducted at other NRC institutes. It will also provide Canadian industries with the product development infrastructure required for business development and offer the means of demonstrating newly developed products and systems, training personnel and interacting with other international programs.

General Inquiries: (604) 221-3000

<http://ic-ci.nrc-cnrc.gc.ca/>

Institute for Chemical Process and Environmental Technologies (NRC-ICPET) - Ottawa, Ontario
Director General: Don Singleton

The NRC Institute for Chemical Process and Environmental Technology (NRC-ICPET) develops chemical process technologies and value-added materials to help Canadian industries improve the commercial viability of their products, reduce costs, manage environmental performance and increase the efficiency of process operations. NRC-ICPET works with Canadian industry to rapidly develop, transfer and commercialize innovative new technologies that enhance competitiveness and create sustainable economic growth.

General Inquiries: (613) 998-8192

<http://icpet-itpce.nrc-cnrc.gc.ca/>

Industrial Materials Institute (NRC-IMI) – Boucherville and Ville Saguenay, Quebec
Director General: Blaise Champagne

The NRC Industrial Materials Institute (NRC-IMI) is a R&D centre focused on materials, their formulation and forming, as well as the control of their processes. NRC-IMI works primarily in the metallurgy, polymer, aerospace, automotive and biomedical sectors. NRC-IMI helps Canadian companies meet the risks of the new economy by providing them competitive advantages and the required leverage to grasp opportunities. NRC-IMI is currently building a new Aluminium Technology Centre in Ville Saguenay.

General Inquiries: (450) 641-5100

<http://www.imi.nrc-cnrc.gc.ca/>

Integrated Manufacturing Technologies Institute (NRC-IMTI) - London, Ontario
Director General: Georges Salloum

The NRC Integrated Manufacturing Technologies Institute (NRC-IMTI) conducts research in the engineering sciences, with an overall orientation towards integrated technologies. Working in collaboration with industry, universities and government partners, NRC-IMTI carries out strategic and commercially-relevant research in systems simulation and control and in production technologies, pursues the development and application of virtual manufacturing and precision and freeform fabrication in support of manufacturing objectives and works with regional leaders in the development of innovation systems and clusters.

General Inquiries: (519) 430-7000

<http://imti-itfi.nrc-cnrc.gc.ca/>

Measurement Standards

Institute for National Measurement Standards (NRC-INMS) - Ottawa, Ontario
Director General: Janusz Lusztyk

The NRC Institute for National Measurement Standards (NRC-INMS) is Canada's national metrology institute. In accordance with the *National Research Council Act*, NRC-INMS is charged with the responsibility to investigate and determine standards and methods of measurement. NRC-INMS carries out a wide range of research and service activities to fulfill this responsibility and to support the Canadian innovation system.

General Inquiries: (613) 990-8750

<http://inms-ienm.nrc-cnrc.gc.ca/>

Molecular Sciences

Steacie Institute for Molecular Sciences (NRC-SIMS) – Ottawa and Chalk River, Ontario

Director General: Tom Jackman (*acting*)

The NRC Steacie Institute for Molecular Sciences (NRC-SIMS) provides leadership in collaboration with the Canadian and international scientific communities in the development of a knowledge base in molecular sciences. NRC-SIMS undertakes fundamental interdisciplinary research programs in partnership with researchers inside and outside NRC to develop innovative technologies and is based on competencies that range from cell chemistry to attosecond science to nano-material. NRC-SIMS administers the Canadian Neutron Beam Laboratory in Chalk River (Ontario) through the Neutron Program for Material Research.

General Inquiries: (613) 990-0970

<http://steacie.nrc-cnrc.gc.ca/>

Nanotechnology

National Institute for Nanotechnology (NRC-NINT) – Edmonton, Alberta

Director General: Dan Wayner (*acting*)

The National Institute for Nanotechnology (NRC-NINT) is a joint venture between NRC, the Province of Alberta and the University of Alberta. NRC-NINT has a national mandate to conduct molecular and nano-scale technology research, development and commercialization focusing on the following major sectors: nanobiotechnology; energy and materials; information and communication technology, and nano-engineering. NRC-NINT will also work to establish Edmonton as an international centre for nanotechnology research and anchor a national nanotechnology R&D infrastructure available to researchers across the country.

General Inquiries: (613) 991-3390

<http://nint-innt.nrc-cnrc.gc.ca>

Ocean Engineering and Marine Industries

Institute for Marine Dynamics (NRC-IMD) – St. John's Newfoundland

Director General: Mary Williams

The NRC Institute for Marine Dynamics (NRC-IMD) provides innovative solutions and technical expertise in ocean engineering and ocean technology. NRC-IMD pursues research programs in ship technology and offshore engineering and works with industries and public sector agencies on projects relating to offshore oil and gas, ship design, marine operations and safety.

General Inquiries: (709) 772-2469

<http://imd-idm.nrc-cnrc.gc.ca/>

Support for Innovation and the National Science and Technology Infrastructure

Canada Institute for Scientific and Technical Information (NRC-CISTI) - Ottawa, Ontario with offices across Canada

Director General: Bernard Dumouchel

The NRC Canada Institute for Scientific and Technical Information (NRC-CISTI) is one of the world's major sources for information in all areas of science, technology, engineering and medicine. NRC-CISTI provides easy-to-use electronic information tools that enable clients to stay on top of new

developments in their fields. NRC-CISTI is home of the NRC Research Press – Canada's largest scientific publisher.

General Inquiries: (613) 993-2341

<http://cisti-icist.nrc-cnrc.gc.ca/>

Industrial Research Assistance Program (NRC-IRAP) - Ottawa, Ontario with offices across Canada
Director General: Margot Montgomery

The NRC Industrial Research Assistance Program (NRC-IRAP) stimulates wealth-creation for Canada through technological innovation. NRC-IRAP's objectives are to increase the innovative capabilities of SMEs and to become the national enabler of technological innovation for SMEs.

General Inquiries: 1-877-994-4727

<http://irap-pari.nrc-cnrc.gc.ca/>

Technology Centres

Canadian Hydraulics Centre (NRC-CHC) - Ottawa, Ontario

Director: Etienne Mansard

The NRC Canadian Hydraulics Centre (NRC-CHC) develops and provides technologies for studying maritime structures, coastal processes, environmental hydraulics and cold regions engineering. NRC-CHC continues to establish itself as a centre of excellence for hydraulic studies that are relevant to Canada and U.S. partners. NRC-CHC is poised to address topics of climate change, energy efficiency, environmental impact assessment, water resources and quality, sustainable development and coastal environments.

General Inquiries: (613) 993-2417

<http://chc.nrc-cnrc.gc.ca/>

Centre for Surface Transportation Technology (NRC-CSTT) - Ottawa, Ontario and Vancouver, British Columbia

Director: John Coleman

The NRC Centre for Surface Transportation Technology (NRC-CSTT) enhances international opportunities for the Canadian transportation industry by providing vehicle engineering and testing expertise and facilities, particularly in the railway sector and increasingly in the defence sector by offering an array of services including projects critical to the deployment of Canadian Forces units in peacekeeping missions. As NRC-CSTT builds on its world leadership in wheel / rail interaction, NRC-CSTT is developing to a similar level of recognition in railway freight car structures and dynamic performance.

General Inquiries: (613) 998-9638

<http://cstt-ctts.nrc-cnrc.gc.ca/>

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