



Communications
Research Centre
Canada

An Agency of
Industry Canada

Centre de recherches
sur les communications
Canada

Un organisme
d'Industrie Canada

A N N U A L

R E P O R T

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F O U N D A T I O N S F O R T H E

F U T U R E

FOUNDATIONS FOR THE

FUTURE



WWW.CRC.CA



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I N N O V A T I O N
r e s e a r c h

OUR VISION

National leadership in collaborative research and development on innovative communications, broadcasting and information technologies for a strong Canadian knowledge-based economy.

OUR MISSION

To be the federal government's centre of excellence for communications R&D, ensuring an independent source of advice for public policy purposes.

To help identify and close the innovation gaps in Canada's communications sector by:

- engaging in industry partnerships;
- building technical intelligence;
- supporting small and medium-sized high technology enterprises.

CHAIRMAN'S MESSAGE



CRC has an illustrious past. In fact, it is a national asset. As we enter the new millennium, the competencies, networks, partnerships and track record that CRC has built become the **foundations for the future**. It's a future in which we can look forward to rapid change and boundless opportunities in communications. These will challenge CRC to continue to demonstrate how combining research excellence with agility, creativity and smart business relations can deliver impact across Canada and the world.

This year, the Board initiated strategic planning support activities with CRC management in two areas: determining the technical areas in which CRC should be a centre of excellence; and deciding what partnerships and activities would enhance access to CRC from across Canada.

I thank the Board members for their support of CRC nationally, and for their contribution of time and energy to the Board and CRC activities. I would like to thank Dorothy Byrne, Jocelyne Côté-O'Hara, Cheryl Knebel and Gilles Delisle for their service, and to welcome James Lau, Carol Stephenson, Carol Darling and David Haccoun as new members.

In particular, I would like to thank Kevin Lynch, past Deputy Minister of Industry Canada, for his involvement and contribution to the Board. I take pleasure in welcoming the new Deputy Minister, Peter Harder.

I would also like to thank CRC's clients in government, academia and industry for their support, and a special thanks and congratulations to all CRC employees for their dedication to CRC's mission and their willingness to share their capabilities across Canada and beyond.

A handwritten signature in black ink, which appears to read "Alan Winter". The signature is fluid and cursive, written in a professional style.

Dr. Alan E. Winter

P R E S I D E N T ' S M E S S A G E



I've had the privilege of being President of this unique Canadian research asset for 3 years and I am still being impressed with the dedication, competence and excellent work of the staff.

A sign of the reach and effectiveness of this "small, capable band" can be seen in the recently completed Smart Communities competition, where CRC was part of three of the 12 winning proposals (Ottawa; Labrador; and an Aboriginal proposal, Knet). This competition is one indicator that we are in one of the most dynamic and impressive economic transformations ever – a revolution driven by the very technologies CRC has worked on over its more-than-50-year history.

This transformation has created considerable chaos in the world, and CRC continues to respond by delivering value. In providing technical support to Industry Canada, we contribute to future regulatory regimes and the business environment, whether the issue is spectrum allocation, connectedness, or electronic commerce. We also provide technical advice to government on evolving communications technologies and standards. Working on standards may not be flashy, but such long-term work by public sector labs such as CRC, in cooperation with our partners from Spectrum, Information Technologies and Telecommunications (SITT), provides a valuable contribution to Canadians.

Our partnerships with National Defence, the Canadian Space Agency and domestic and international industrial and academic players follow the Internet thought that "none of us is as smart as all of us."

*"At CRC, we're fast on the past,
but poised for the future."*

We continued to collaborate in working groups, conferences and projects this year, to build new and productive partnerships for innovation. At the same time, we celebrated the successes made by the CRC's Innovation Centre's high-tech startups. This year, our technology transfer and collaboration agreements brought in over two million dollars.

In the competitive "war" for talent, we launched a recruitment campaign using our redesigned Web site as the preferred tool.

CRC generates excitement about what is possible as our researchers apply deep technical competencies to develop and prove new ideas. In the following pages, I am proud to present a selection of achievements in our five research areas: satellite communications, radio science, broadband network, broadcast, and terrestrial wireless technologies.

Success, like failure, has a price tag. For CRC, it will be how to build on its outstanding past in a time of dramatic change.

Gerry Turcotte

"We shape our tools, and thereafter,

FORGING THE
FUTURE
IN BROADBAND MULTIMEDIA

The World in 3D...



- Our research showed that 3D TV can be easily transmitted over digital television channels with little additional capacity.
- **The 3-Dimensional Minister...** Our experimental video camera filmed Industry Minister John Manley in 3D.
- We demonstrated a real-time MPEG-2 transmission of 3D video over ATM networks at the Canadian Conference on Broadband Research, using specialized equipment we developed.
- Broadcasters from around the world learned more about digital television from us at a seminar at the National Association of Broadcasters Convention 2000.

VQEG

Co-chaired international Video Quality Experts Group, seeking objective measures of picture quality.



DID YOU HEAR THAT ... ?

CD-quality sound on digital radio stations is now available in Toronto, Montreal and Vancouver...and we helped get it there!



Multimedia datacasting expertise...bringing together wireless and digital radio...

Imagine driving in Ottawa and being able to check the weather in Vancouver...or travelling with the kids and being able to find out all about the next rest stop at a touch of a button....

our tools shape us."
Marshall McLuhan

SETTING STANDARDS AROUND THE GLOBE

- **The world wants to know...**We were invited to share our radiowave propagation expertise at the Antenna and Propagation conference in Switzerland and with the International Telecommunications Union (ITU).
- **A World First...**Looking for your ideal sound quality from things like your PC audio download? Solutions are on the way...use our method for subjective evaluation of audio systems with intermediate audio quality to select... now an ITU international standard.

- **Canadian Digital Television (CDTV) and Digital Radio Roll-Out Inc. (DRRI)** count on our expertise to shape the future of TV and radio.
- **Quality is Job 1...**Never before has there been commercial software for subjective and objective evaluation of audio quality. Now there's CRC-SEAQ. The method it uses is based on an international ITU-R standard that we helped develop.

Our BADLAB was the first Canadian lab to offer Ottawa's R&D community access to CA*net3, the most advanced optical R&D Internet in the world.





BUILDING A
SAFER WORLD
USING WIRELESS

Milestone...

10,000 lives saved!!!....The Cospas-Sarsat satellite system we helped develop for search and rescue began operating in 1982.

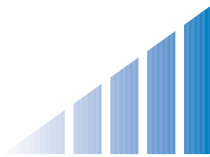
We're designing and testing high-power microwaves that National Defence is using to neutralize land mines.



“We have one of the most professional intellectual property operations in Canada.”

Gerry Turcotte, CRC President

PUTTING OUR TECHNOLOGY TO WORK

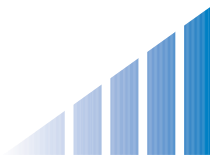


Patent portfolio grows...

25 new patent applications

9 newly issued patents

216 active patents for 84 inventions



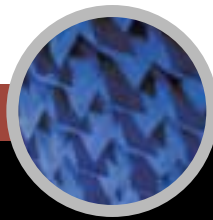
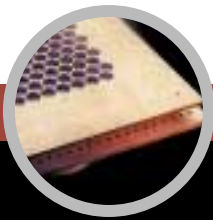
More tech transfers...

88 new IP agreements

(licences, non-disclosures,
Memoranda of Agreements)

353 active IP agreements

CRC inventors were awarded \$211,000 for their inventions that were licensed to industry.



After only a single day of operation in a test in Jamaica, **Spectrum Explorer** discovered over 50 radios in a band where only 30 were licensed to operate.

Engineering and broadcasting companies worldwide are using **CRC-COV** and **CRC-Predict** to determine the best place to put transmission towers.

Tech transfers to private industry resulted in 77 R&D collaborative agreements, leading to 104 active contracts.

Our **Milton System** continues to test our novel, inexpensive antenna technologies.



IMPROVING ACCESS THROUGH TECHNOLOGY

- As the government's centre of expertise in satellite communications, we are managing the \$80M Payload Flight Demonstration Program for the Canadian Space Agency, where Telesat, COM DEV and EMS Technologies will develop and launch a multimedia payload on Anik F2 in 2002.
- For the third time this decade, we hosted the International Mobile Satellite Conference. About 350 people from 17 countries attended the event, co-sponsored with NASA, the Jet Propulsion Laboratory, and the Canadian Space Agency.



Tele-learning...

- School teachers will use **LearnCanada**, national K-12 collaborative learning through broadband, for professional development. Partners: industry, government, academia and school boards across Canada.

Tele-health...

- Our technical expertise and satellite earth stations were used to link remote communities, where doctors using **I-SITE** detected a leading cause of blindness in patients without having to send them to the city.



CRC's Jim Hamilton received an award for the Healthcare and Education Access for Remote Residents by Telecommunications (HEARRT) project.

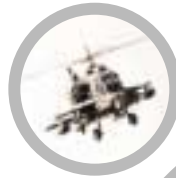
100 to 1,000 Megabits per second per square kilometre.....
The Microwave Light Organized Network (MILTON)...new wireless technique to connect Canadians to the Internet.



Our expertise in Wavelength Division Multiplexing (WDM), a key fibre optic technology, is being used to develop ways to bring broadband services to the home.



PARTNERING FOR THE FUTURE



Developing Military Communications...

- The Canadian Navy is using our advanced network interoperability technology that allows seamless, interoperable, multimedia, quality-of-service based communications between varied bandwidth links, including wireless HF, VHF, satellite and landline.
- DND is using our **Smart Antenna** technology for reliable HF communications between military aircraft in the north, naval ships on our coasts and the NORAD command centre in North Bay, Ontario.
- We're part of a NATO HF Radio Working Group developing a new high data-rate HF communications standard.
- **More efficient multicast communications...** Working with other countries, we developed a protocol that will become an international military and Internet standard for point-to-multipoint communications.

Pooling great minds...

March 21, 2000 – Launch of National Capital Institute of Telecommunications. Headquarters at CRC's new Reginald A. Fessenden Building.

Our partners: Carleton University, University of Ottawa, NRC, Nortel, Newbridge, Bell Nexxia, QNX Software Ltd. and the Regional Municipality of Ottawa-Carleton.

International spotlight...

We teamed with CIDA to train researchers from India's Centre for Development of Telematics (C-DOT).



Our **VirtualClassroom** allows students of all ages to explore the world of technology...



FOCUSING ON THE NEXT GENERATION



Our Innovation Centre graduated 7 high-tech startups, bringing the number of alumni to 21. We currently have six Innovation Centre clients on site.

“Our time in the Innovation Centre helped cut 4-6 months off our performance schedule. The support we got from the people at CRC was a tremendous benefit.”

J. Peter Brownhill, president, Nu-Wave Photonics

“CRC provides unequalled access to researchers, advanced networking technologies and technical libraries. We couldn't have custom-designed a better combination.”

Bruce Linton, president, webHancer



- JDS Uniphase is funding post-graduate students to work in our photonics labs.



Dr. John Belrose (far left) and Gerry Turcotte (far right) presented the prestigious Fessenden awards to engineering post-graduate students Eric Choinière and Micah Stickel to encourage study in our research areas and to promote relations with academia.

BUILDING OUR TEAM

of many talents...

Our band made it to the finals of **Tech Rocks**, opening for Tom Cochrane. The event raises money for educational programs to **develop Ottawa's tech talent pool.**

CRC hopeful makes Olympic bid...

Sat-com co-op student Homy Kamkar-Parsi is a **table tennis champ...**

The CRC campus welcomed Industry Canada's Certification and Engineering Bureau to its new Reginald A. Fessenden Building. CRC is located on 600 hectares in the heart of Silicon Valley North, Canada's strongest high-tech hotbed.



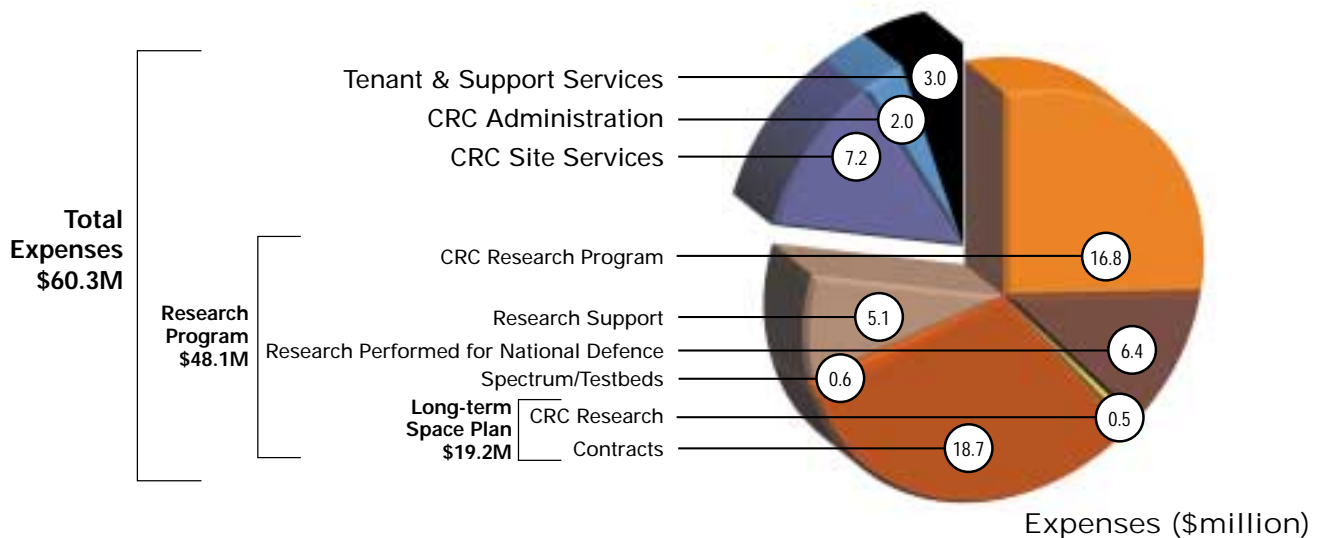
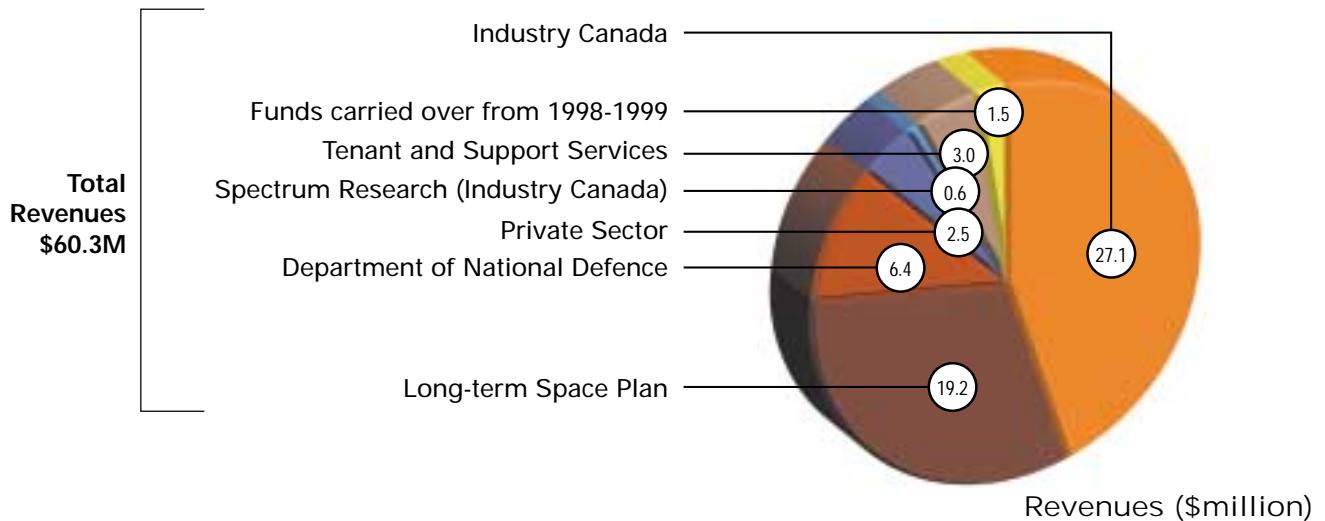
The Shirleys Bay snow sculptors placed second in the Corporate/Business category at Winterlude 2000 for their frosty depiction of the Brain Drain.



CRUNCHING THE NUMBERS

Each year, CRC receives funding from a number of sources, both government and non-government. In 1999-2000, Industry Canada, our primary client, provided 45% of incoming funds. Other government funding is provided mainly by DND and CSA to carry out research and to cover costs related to their residence on the CRC campus. Revenue opportunities with the private sector are increasing through the licensing of Intellectual Property and contracted R&D.

1999-2000 Revenues and Expenses (\$million)



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