



National Research  
Council Canada

Conseil national  
de recherches Canada

**NRC · CNRC**

*Industry, government, university  
relations -- Case studies of successful  
partnerships*

**Dr. A. J. Carty, President**

**Canadian Operational Research Society Annual Conference**

27 May 1997

**Canada**

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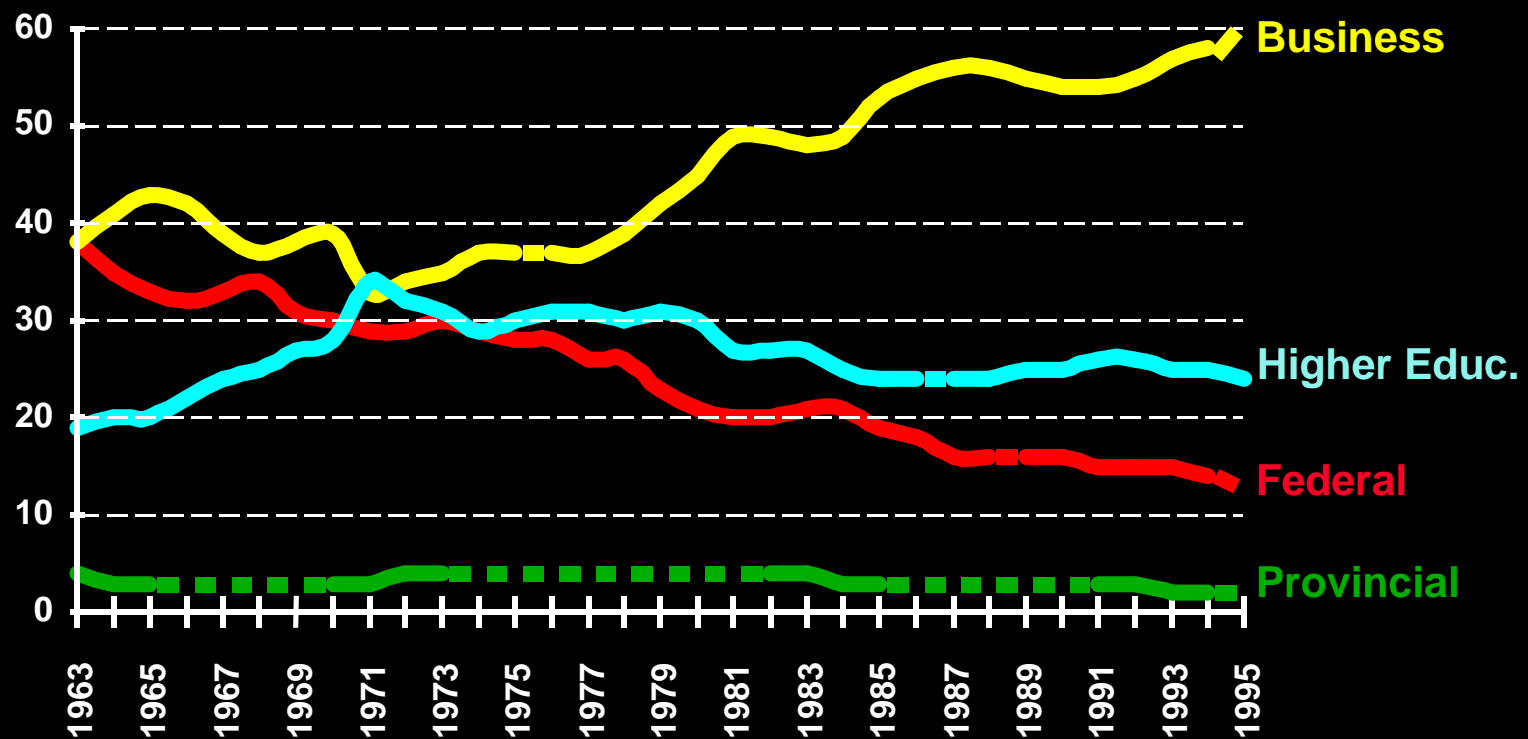
## *Canadian R&D Gaps*

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**Canada has both a strategic research gap and an innovation gap**

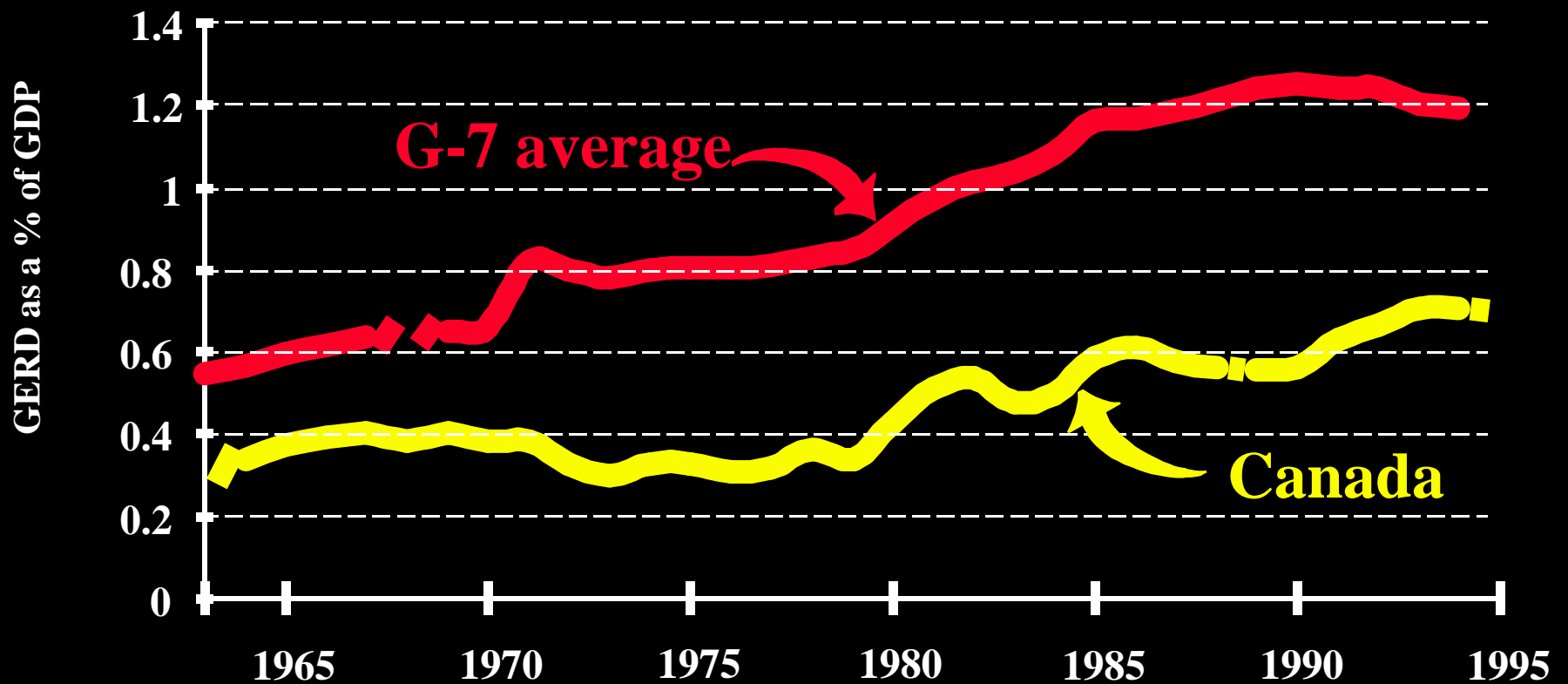
- Strategic gap: lack of private sector investment in medium- to long-term strategic R&D in major industrial labs
- Innovation gap: failure to transfer technology and capitalize on the results flowing from government and university research establishments

## *Percentage of GERD by Funding Sector (1963-1995)*



Source: OECD Main S&T Indicators

# *Industrial Investment in R&D as a % of GDP (1963-95)*



Source: OECD Main S&T Indicators

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## *Percentage of GERD Financed by Industry*

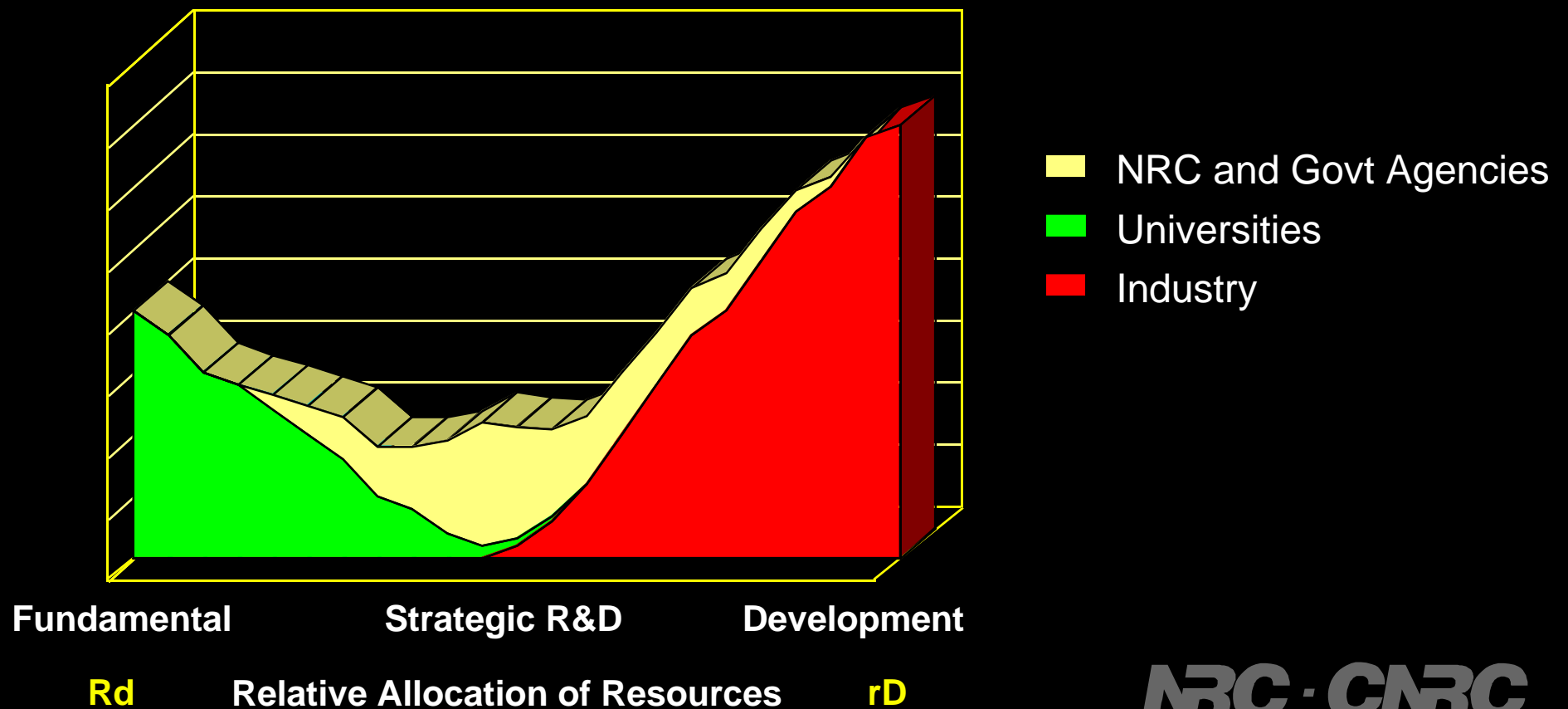
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	1993	1994 <sup>p</sup>	1995 <sup>p</sup>
Canada	44.2	44.9	45.7
Japan	68.2	68.2	---
USA	58.7	59.0	59.5

**\* Source: OECD, Main Science and Technology Indicators, May 1996**

**p - Provisional**

# *Bridging the Research Spectrum*



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## *National Research Council*

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- created in 1916
  - “to bring about united effort and mutual co-operation in solving problems of scientific and industrial research”
- research institutes, facilities, IRAP, CISTI

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## *NRC's Vision to 2001*

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*To be a leader in the development of an innovative, knowledge-based economy through science and technology*

- research excellence and relevance
- collaborations and partnerships in key technologies
- leadership in developing Canada's innovation systems
- entrepreneurial approach to the commercialization of NRC technology

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## *NRC Collaborations*

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- NRC is involved in more than 1600 research collaborations with industry
- Types of interactions:
  - Collaborative Research Projects
  - Facilities-based Partnerships
  - Collaborative Research Centres
  - Incubators
  - Consortia
  - Special Interest Groups

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## *Consortium Case Study - SSOC*

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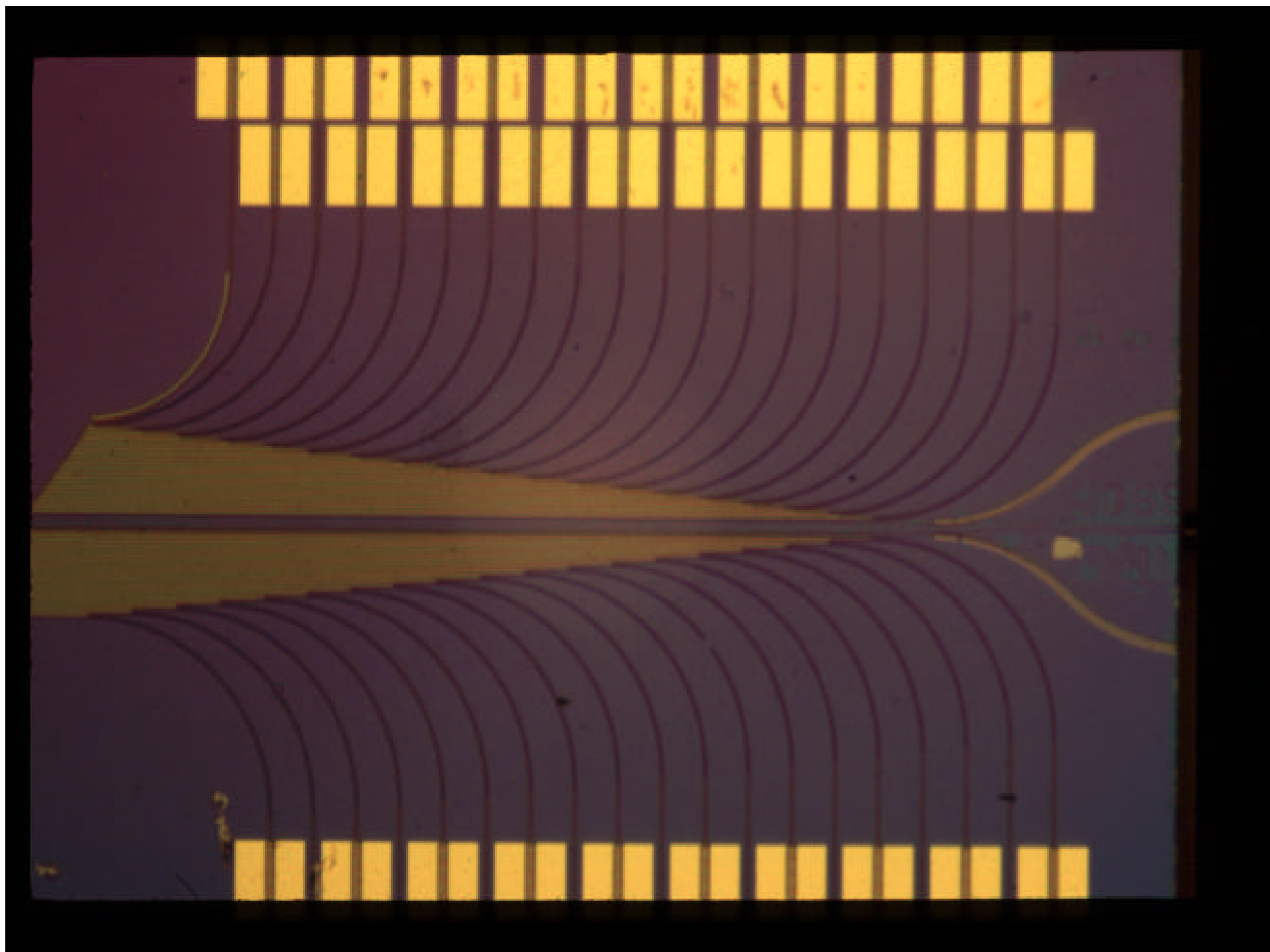
- Consortium to create a Canadian capability in integrated optoelectronics research for applications in the information industry
- Technology developed: Wavelength Division Multiplexing

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## *SSOC Members*

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- Bell Northern Research (now Nortel)
- Department of National Defense
- EG & G Optoelectronics
- MPR Teltech Ltd.
- TR Labs
- ITS Electronics
- Seastar Optics
- Communications Research Centre
- National Optics Institute



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## *Consortium Case Study - OPCOM*

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Mission: to develop and integrate the enabling technologies to build an optoelectronic processor for high-speed processing and parallel access to large data bases

- Five-year, \$20 M pre-competitive research venture

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## *OPCOM Members*

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- National Optics Institute
- Ottawa-Carleton Research Institute
- KOM Inc..
- Spar Aerospace Ltd.
- Optoelectronics Inc.
- Andrew Engineering
- DynaTek Automation Systems
- Oprel Technology
- OPTEX
- National Research Council

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## *OCRInet*

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- Provides and manages the first ATM broadband network in Canada dedicated to research, development and demonstration of new and innovative network technology, services and applications

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## *OCRIInet founding partners*

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- Algonquin College
- Bell Canada
- Bell Northern Research (now Nortel)
- Carleton University
- Communications Research Centre
- Gandalf Technologies
- Mitel Corporation
- National Research Council
- Newbridge Networks
- Stentor Resource Centre
- Telecommunications Research Institute of Ontario
- Telesat Canada
- University of Ottawa



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## *NRC Special Interest Groups*

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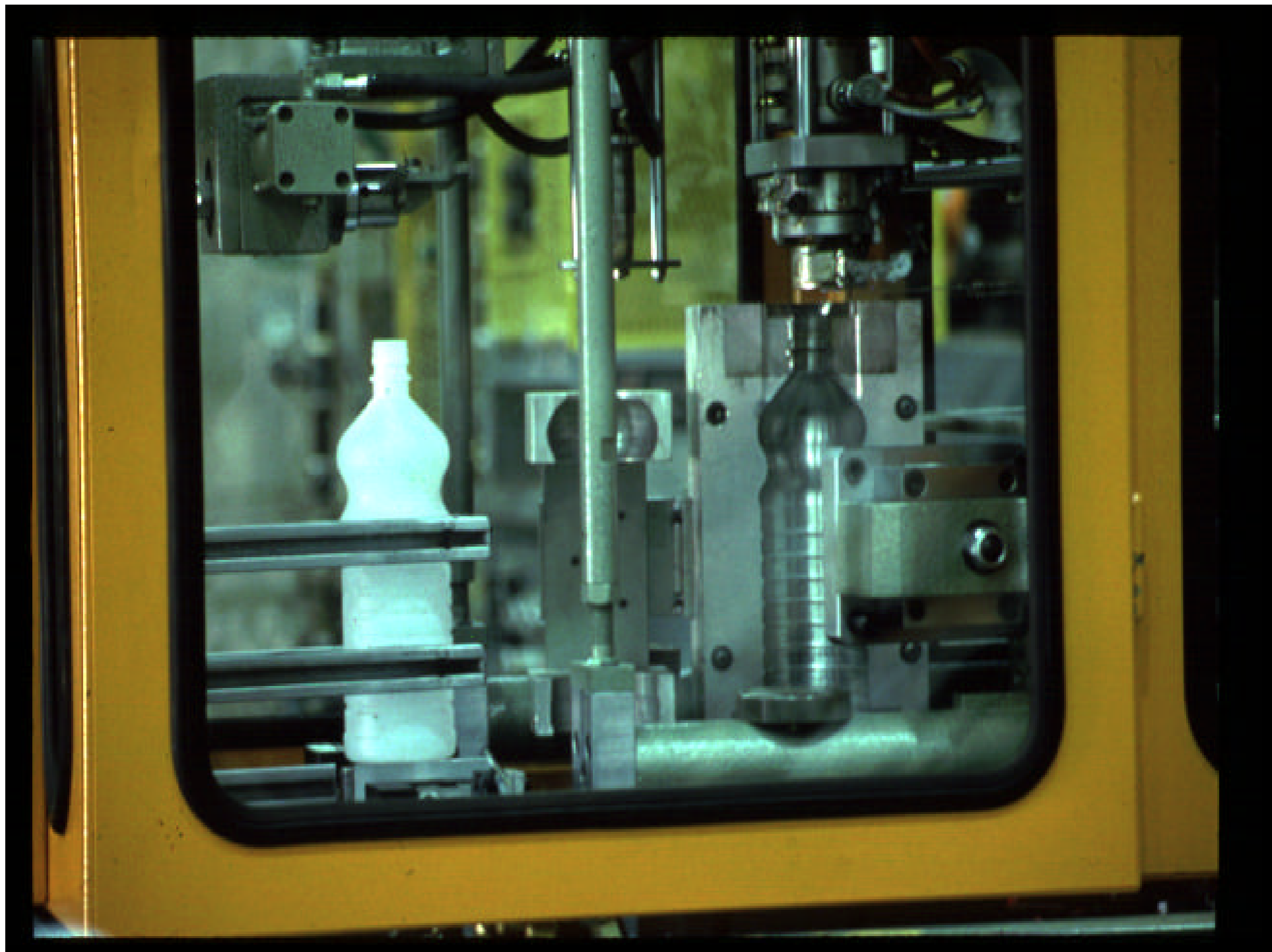
- Provide industry input into pre-competitive R&D
- Help set NRC research priorities
- Members gain information on latest trends and access to facilities and training

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## *NRC Special Interest Groups*

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- SIGIM (injection molding)
- SIGBLOW (blow molding)
- SIGCAST (die casting)
- BLENDTECH (Polymer compounding)
- SURFTEC (surface technologies in resources and aerospace sectors)
- FOAMTECH (polymer foams)



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# *Natural Sciences and Engineering Research Council*

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## **Partnership Programs (est. 96-97 expenditure)**

- Strategic Projects (\$40M)
- University - Industry Projects (\$39M)
- Networks of Centres of Excellence (\$23M)
- Technology Partnerships Program (\$4M)
- Research Networks (\$6M)
- Industrial Research Chairs (\$12M)

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## *NSERC Industrial Research Chairs*

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To assist universities to build up a critical mass required for major research efforts in areas of interest to industry

- 181 Industrial Chairs Awards since 1984 totaling \$161 M; industrial commitment of \$148 M
- Life Sciences; Engineering, Computing and Statistics; Physical Sciences

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## *Networks of Centres of Excellence*

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- Links experts across Canada in many scientific and multidisciplinary fields to promote excellence
- Permanent funding established by the 1997 Federal Budget
- Annual allocation set at \$47.4 million
- Funding cycles increased from four to seven years

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## *Networks of Centres of Excellence*

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- Help to retain Canada's scientists and engineers
- Creates multidisciplinary, multisectoral programs, national in scope
- Promotes commercialization of technology developed

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# *Networks of Centres of Excellence*

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- 14 Networks cover 5 technology areas
  - health and biotechnology
  - information technology
  - natural resources
  - infrastructure
  - human resources



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## *Networks of Centres of Excellence - Impact*

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- 35 spin-off companies with 143 employees
- commercialization of technology
- creation of new jobs
- training of HQP in strategic areas

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## ***NRC - NSERC Research Partnership Program***

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A five-year, \$20 million jointly funded program to:

- Capitalize on complementary R&D capacities
- Build strong three-way linkages between NRC's institutes, universities and industry
- Enhance knowledge and technology transfer
- Develop research skills of highly qualified personnel

Two competitions have been held; 31 projects funded

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## *NRC - NSERC Research Partnership Program*

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e.g. : SiGe Photonic Devices

- Nortel, Mitel, Gennum, Carleton University, NRC
- study to determine basic optical properties of SiGe layers for potential use in optoelectronic integrated circuits
- pool resources in state-of-the-art facilities at NRC

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## *Facilities-Based Partnership Case Study - SiGe CVD*

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Silicon- Germanium Chemical Vapour Deposition facility

- A facilities-based partnership providing state-of-the-art equipment worth \$1.2 million
- Founding partners:
  - NRC
  - Northern Telecom
  - NSERC (on behalf of university community)

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# *Consortium for Software Engineering Research - CSER*

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- Addresses the need to:
  - improve the quality of software engineering education
  - produce more software engineers
- Industry-driven; industry defines research problem
- University staff work on-site, in industry

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# *Consortium for Software Engineering Research - CSER*

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- Founding partners with collaboration of NRC and NSERC:
  - Bell Canada
  - Mitel Corporation
  - Nortel
  - Object Technology International
  - IBM Canada Ltd.
- Universities: Victoria, Toronto, Waterloo, Ottawa,  
Montreal, Acadia

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## *Consortium for Software Engineering Research - CSER*

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- \$18 M value over five years
- Demonstration Centre at NRC to exhibit results
- Board of Directors with industry and university representation; NRC provides a Research Director and Operations Manager



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## *O-Vitesse*

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- Responds to an identified need for trained software engineers
- reskills unemployed or underemployed university graduates
- 16-month mixture of work terms and course work

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## *O-Vitesse*

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- 431 formal applications received after running an ad in one paper
- over half had post-graduate degrees
- 20% were unemployed; many underemployed

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## *Consortium for Graduate Education in Software Engineering - ConGESE*

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- A unique program which offers an advanced degree in software engineering:
  - part-time, during work hours
  - at the work site
  - with courses provided by any or all of six universities
- Financially supported by IBM Canada and Nortel, and the Information Technology Research Centre

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# *ConGESE*

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- Participating universities:
  - Carleton University
  - Queen's University
  - University of Ottawa
  - University of Toronto
  - University of Waterloo
  - University of Western Ontario
- ConGESE coordinates the program; universities grant the degrees

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## *Government-University-Industry Partnerships: Lessons Learned*

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- Industry partners must be involved from the outset
- Partnership objectives must be clearly stated
- Access to intellectual property must be defined
- Planning targets should be established
- Partnerships must be flexible enough to allow participation based on competencies and commitment, not size

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## *NRC - NSERC Research Partnership Program*

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- biotechnologies
- construction technologies
- engineering technologies (including aerospace and marine technologies)
- information and telecommunications technologies
- manufacturing technologies (including materials and chemical processes)
- integrated manufacturing and sensor and control technologies
- molecular sciences, astrophysics and national measurement standards

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## *ASRA Case Study*

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- Joint funding provided by:
  - Department of Defense
  - NSERC
  - Bell Helicopter
- Equipment provided by:
  - CAE Electronics Ltd.
  - Canadian Marconi Company
  - Litton Systems Canada Ltd.

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## *Facilities-Based Partnership Case Study - ASRA*

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### Advanced Systems Research Aircraft (ASRA)

- a third generation helicopter research platform
- initial cost \$4.8 million (Cdn)



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# *Canadian Technology Network*

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- CTN provides national and international one-stop shopping for SMEs for technology and business related:
  - information
  - contacts
  - expertise

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## *Canadian Technology Network*

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- Established by Industry Canada and NRC
- Sponsored by NRC's Industrial Research Assistance Program and Industry Canada's Strategis
- Partnered by the Canadian Advanced Technology Association's TechnoGate

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