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# **Summary of CRC International Benchmarking Study**

**Study prepared by Hugh Dysart and Associates for CRC**

March 2007

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**Introduction**

The Government of Canada spends approximately two billion dollars a year on federal research laboratories in the science-based departments (SBDAs) including the National Research Council. Based on a variety of measures, Communications Research Centre Canada is generally recognized as a leading R&D laboratory among the SBDAs and compares favourably with the NRC institutes on major performance indicators.

There is very little data available on which to rate CRC's comparative performance against similar laboratories on the international stage. With the federal government's current attention on accountability and the SBDAs under increasing scrutiny to demonstrate relevancy, CRC authorized an international benchmark study to examine CRC's performance against a selected group of government-funded laboratories around the world. Hugh Dysart and Associates was engaged on contract to conduct the study for CRC.

**Objective**

The objective of the study was to measure CRC qualitatively and quantitatively against a selection of R&D laboratories in the ICT sector world-wide

**Study Group**

Eight labs with R&D focus comparable to CRC were selected:

Institute for Telecommunications Sciences (ITS), USA;  
Lincoln Laboratory, affiliated with MIT and U.S. Department of Defense;  
Heinrich-Hertz Institute (HHI), Germany;  
Netherlands Organization for Applied Scientific Research (TNO);  
Technical Research Centre of Finland (VTT);  
Electronics and Telecommunication Research Institute (ETRI), Korea;  
Industrial Technology Research Institute (ITRI), Taiwan;  
Commonwealth Scientific and Industry Research Organization (CSIRO), Australia.

**Qualitative Assessment Summary**

CRC is unique within the mix of laboratories against which it is compared, in that it is the only laboratory that has a communications/telecom R&D focus with an explicit mandate to support government policy/regulatory development, while also assisting industry through technology transfer.

Most international institutes have a broader R&D scope covering the entire Information and Communications Technology (ICT) sector. Wireless communications is the common R&D program found across the 8 institutes, with satellite and broadcast communications a niche area in a few. Communications security is a common research thread across most of the institutes. Five of the institutes examined are multidisciplinary organizations with a specific lab dedicated to ICT. The larger national labs such as ITRI, CSIRO and TNO have significant education and training

responsibilities in addition to strong industrial integration to assist national economic development. Across all laboratories studied, provision of policy advice was not a core function except where the lab is an instrument of economic development policy. Explicit participation in national and/or international standards development was also a limited function and generally not a high priority of all labs surveyed.

The highest degree of commercial focus and integration of laboratories with industry is found in Asia, where ETRI in Korea and ITRI in Taiwan are heavily concentrated on technology development, patenting and commercialization of the laboratory developed intellectual property by national companies. All of the laboratories surveyed, except ITS, have active international collaborative programs with academic institutions and the private sector. CRC is 5<sup>th</sup> on the list when ranked against the other labs on collaborative or contract R&D projects per researcher.

### **Quantitative Assessment Summary**

It should be noted that Dysart and Associates had limited time and budget to gather the required data to complete the bench mark study. Due to the fact that several of the large international institutes were not able to report data for their ICT laboratories separately, data had to be normalized in order to draw a CRC comparison.

Nonetheless, the consultant is confident that the information gathered provides a reasonable snapshot of CRC's performance relative to other government labs worldwide that are dedicated to similar research in the ICT field.

On a normalized basis CRC ranks at or near the top of the group studied for the following performance indicators.

- First overall based on a normalized average of output measures that includes number of papers published, patents held, research contracts issued and technology licenses with third parties.
- First overall in number of technology licenses per researcher.
- Second overall in papers published per researcher.
- Third smallest lab with a budget of \$43 Million and 357 total staff (excluding campus operations).
- One of the largest laboratories in the world specializing only in Communications.

### **Conclusion**

CRC's relative performance is outstanding in almost all output metrics. It does well despite the fact its budget is small relative to most international competitors. On a normalized basis, commercialization efforts out-perform all others.



## R&D Areas in Various Labs

International Lab Benchmark Comparison									
	CRC	ITS	Lincoln	ETRI	ITRI	CSIRO	TNO	VTT	HHI
<b>R&amp;D Areas</b>									
Communication	BB Apps	Communication	Next Gen Internet	Digital Home	BB Tech	Network	Cable/DSL	No	No
Networking	Comm Networking	System/Nets	Global Defense	BB Networks	FTTC, 10GE, etc.	Technology	In-house Net		
	Optical and Mobile		Networks				Services Platform		
Broadcast Research	MM Data	No	No	Digital Broadcast		No	No	No	No
	HD Broadcast			TV					
Satellite Research	Applications	No	Spacecraft LAN	No	No	No	No	Space R&D	No
	Broadband Comm		Space Surveillance					Instrumentation	
	Project Mgt		WB net Sensors					Millimeter Waveguide	
Wireless/Radio	SDR	Radio Research		Mobile 4G	Mobile Info Mgt	Antennae	WiMax	Platforms/Svc	MIMO, 1GLan
Research	BB Access	Wireless V+D	Wireless Networking	RFID	Mobile GUI	Location Tech	In-Building	Mobile Interactions	Nets
	Radio Propagation	Spectrum Mgt		Telematics	3G Tech		Spectrum Mgt	Location Mgt	Mobile BB
	Spectrum Mgt	and Stnds						RF/EMI	
	Antennae Research							Telematics	
Defense/Security	Security	Privacy/Security	Air/Ocean Defense	IT Security	No	E-Security/Privacy	Defense Security	No	No
	Network Intrusion		Ballistic Missile			Image technology	and Safety		
Optical Network	Components	No	All Optical Nets	No	Nano Electron	No	No	No	Photonic Net
Components	Optical Networking		Optical Lasers		Optical tech				and Systems
			and Detectors		Optical Storage				Optical
									Components
Other Areas	A/V Quality	A/V Quality	Air Traffic Control	Embedded S/W	E-Learning	Internet Comm	Sensors/Instrumentation	Image	
	Microelectronics	EMI Modelling	Advanced	IT SoC	Biomedical App	Robotics/Sensing	(Wireless, optical, EM)	Processing	
			Electronics	Robots	for Home care	Info Systems	Industrial Solutions		
			Speech Processing	Digital Content		Autonomous Systems	(HC, Internet, Man)		
			Information				Electronic Component		

- Satellite and broadcast unique CRC niche areas
- Wireless and general networking common
- Security in 6 of 9 but varies in focus
- Optical research in 4 of 9 but varies in focus



## Mission/Visions/Scope

Organization	CRC	ITS	Lincoln	ETRI	ITRI	CSIRO	TNO	VTT	HHI
Mission/Vision/Scope									
Scope of Research	Telecom	Telecom	Defense Electronics	Broad ICT	5 Core/6Focus ICT is one	Broad /14 Areas ICT is one	5 Core Areas ICT is one	7 Areas ICT is One	ICT
Degree of Commercial Focus	Med	Very Low	Low - MIT	Very High	High-Focused	Medium- Global	High	High	Low-Med
Incubation/Investments	Tech/Space	No	No	Tech/Space/\$ Promotion	Tech/Space/\$ Active transfer	Not explicit	Holding Co for Spin-offs	Tech.Space/\$ & Invests	No
Education/Training Mandate	No	No	No	Limited	Yes 300 Classes	Significant 7000 Students	Significant 35 Knowledge Centers at UN	No	No
Policy Implementation	Limited	Limited	No	Sets and Drives	Economic Deve.	4 Flagship Projec	Partial - SMEs	No	No
Support Policy Development	Spectrum	Yes	No	Active S&T	Not evident	Small	No	No	No
Degree of Standards Efforts	Small	Small-Med	Small	High 900 Contr	Small(Focused)	Small	Small-Med	Small-Med	Small(Focused)
Internal Gov't Dept Support	Medium	Med-High	High	High	High	High	Medium	Low-Med	Low
	ICT Lab		Public Private	ICT Lab	ICT in National Labs				ICT Lab

- **Large national labs different from more focused ICT labs via:**
  - Additional Education/Training mandate.
  - Scope for Incubation and Investment.
- **Policy advice** is not generally a core function except where the lab is an instrument of Economic Development policy.
- **Standards** generally not a high priority.

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