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Canada

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EVALUATION OF CONTRACTING-OUT POLICY

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1. INTRODUCTION

The purpose of this paper is to review the policy for contracting-out the government's requirements in science and technology. The Contracting-Out Policy (originally referred to as the Make-or-Buy Policy) was introduced in 1973, with the objective of increasing the proportion of government research and development requirements contracted out to industry rather than performed in-house. Through the implementation of this policy, it was expected that the innovative capacity of Canadian industry would be strengthened and its competitive position enhanced.

An initial review of the policy was made in 1975 and concluded that the policy was proving to be an effective tool in encouraging industrial innovation and participation. However, it noted that the possibilities for an extended program of contract R&D would require a substantial increase of funds allocated to such an extension.

It should be noted that government grants, contributions and other programs are referred to in a number of places in the present study. These references are made for the sole purpose of presenting an overview of the relationship and proportion of contracting-out to other areas of government expenditure on science and technology. No conclusions should be drawn about any measures other than contracting-out on the basis of the present study.

2. THE POLICY

"The government recognizes that science and technology are vital to the physical and social structure of Canada and, if wisely fostered and used, can provide desirable future options for Canadians. Since the government has many science and technology requirements to meet in support of departmental missions, its policy of contracting-out these requirements reflects its belief that it is in the national interest to encourage the fullest possible participation of Canadian industry in meeting these needs, to stimulate industrial innovation and thus provide additional benefits to the economy. The government has therefore provided, subject to overall financial constraints, that its mission-oriented, science and technology requirements in the natural sciences and the human science fields of urban, regional and transportation studies be contracted-out to the private sector, and especially to Canadian industry. This is done to obtain a more even balance in the coming years between scientific activities performed by industry and by the government, in support of departmental missions.

The significance of this policy to departments will depend on the degree to which departmental practices already conform to it and on the extent to which departmental science and technology requirements are excepted under it."

In order to conform to the policy, government departments are required to contract-out mission-oriented science and technology requirements. However, there are certain instances under which departments can justify in-house performance. The criteria for in-house justification are as follows:

(a) where questions of security or policy sensitivity preclude private sector involvement;

(b) where the conduct of science and technology is essential to establish and maintain a limited in-house competence sufficient:

i) to enable the department to perform its mission,

ii) to assess the opportunities represented by the current state of the art, and

iii) to manage its science and technology requirements being performed in the private sector.

(c) where the science and technology capability needed to perform the mission of the department is inappropriate to the private sector, or does not exist in the private sector, and it would not be of optimum benefit to Canada to create one;

(d) where the science and technology capability is essential to provide direct support to a regulatory function and associated planning activities, and no private establishment independent of the individuals and organizations being regulated can be found or created (e.g., certain aspects of research associated with food quality, narcotics control, transportation safety regulations and communications);

(e) where the science and technology capability is essential to the development and maintenance of a set of national primary standards and, in some cases, secondary and consumer standards including their relationship to international standards;

(f) where the conduct of science and technology is necessary to the effective support and operation of in-house capital facilities which provide federal testing and research services that are agreed, after appropriate consultation, to be necessary to Canadian industry.

As noted above, the policy is directed at encouraging Canadian industry to participate in meeting Canadian government science and technology requirements. The guidelines for the policy stipulate that, as a general principle, the government's mission-oriented science and technology requirements are to be contracted-out to the private sector for performance in Canada. Within the private sector, highest priority is accorded to industrial performers. However, where no industrial performer can be found, requirements are to be contracted to other private sector performers.

3. BACKGROUND

After evaluating the impact of the contracting-out policy between 1973 and 1975, the government reaffirmed its desire to obtain full industrial participation in meeting governmental science and technology needs by announcing, in August 1976, the decision to extend this policy further to:

(a) ongoing as well as new science and technology requirements;

(b) science and technology requirements in the natural sciences, where the previous policy applied to research, development and feasibility studies only. This extension encompasses related scientific activities: scientific data collection, scientific information activities, testing and standardization;

(c) science and technology requirements in the human and social science fields of urban, regional and transportation studies; and

(d) unsolicited science and technology proposals to meet any priority government requirement.

(The previous policy applied only to proposals to meet priority requirements in support of departmental science missions).

According to Chapter 314 of the Administrative Policy Manual, entitled "Science and technology -- contracting-out", dated December 1978, the Ministry of State for Science and Technology is responsible for conducting "periodic evaluations of the policy to determine its effectiveness, including detailed review of the procedures established by these guidelines (in-house justification, central procurement procedures when contracting-out is decided upon, etc.). The first such evaluation is to begin two years after the release of the policy...". The present document constitutes the first such evaluation as referred to above.

Furthermore, the Chapter required departments/agencies to submit contracting-out plans each spring with the Program Forecast. This was done in 1978 and 1979, and then lost sight of during the establishment of the envelope system, although the circular is technically still in effect. Recently, there has been introduced a requirement for departments/agencies to submit Operational Plans on a three-year time frame. Such plans would account for all of the existing A-base and therefore, would include the material in the TB circular.

4. EVALUATION METHODOLOGY

One objective of the policy is to obtain a better distribution between the scientific activities performed by industry and those performed by government, since it is believed that increasing industrial participation in government science activities stimulates industrial innovation and provides economic benefits to the economy. Although emphasis will be placed on determining the degree to which a better distribution has been achieved since the inception of the policy, consideration also will be given to the impact of the 1976 policy expansion. In addition, the most common criticisms of the policy will be discussed in order to determine their validity.

For the most part, the information required to apply to the criteria has been obtained from the Science Statistics Centre of Statistics Canada, and from the Science Centre at the Department of Supply and Services.

To supplement this information, informal interviews have been carried out with representatives of various departments directly engaged in the contracting-out process and, to a lesser extent, with representatives of the private sector.

5. CONTRACT STATISTICS

In preparing this evaluation, statistics from two separate sources -- Statistics Canada and the Department of Supply and Services -- have been used. Since there are certain discrepancies between the two sets of data, it is necessary to compare and explain the differences before continuing with the discussion of the evaluation criteria. Table I on page 12 presents Statistics Canada figures on federal government expenditures on natural science R&D contracts broken down by major departments, while Table II on page 13 presents DSS figures on mission-oriented science contracts awarded by the DSS Science Centre. The Statistics Canada figures are for contract expenditures, while the DSS figures are for dollar amounts of contracts awarded. In addition, the DSS statistics represent all contracts covered by the policy which are contracted through the Science Centre. Therefore, they include contracts for RSA, and for activities in human science areas -- including urban, regional and transportation -- but exclude any contracts which are handled by other departments and other branches of DSS. The Statistics Canada table includes R&D contracts in the natural sciences, as reported by departments, without reference to which part of DSS they were contracted by. However, the Statistics Canada data does not include contracts for RSA or for the human science areas.

In comparing the two tables, it is evident that there is a lag between contract awards and contract expenditures. This is particularly noticeable in the case of NRC. Between 1975/76 and 1977/78, NRC awarded several major contracts for the development of the remote manipulator system. These contracts show up in the DSS table in the year when the contracts were awarded, while they show up in the Statistics Canada table in the year the funds were spent.

Another difference between the statistics is that Statistics Canada includes expenditures from the DSS bridge fund for unsolicited proposals under the Supply and Services heading, while DSS statistics show it under the department which has sponsored the unsolicited proposal. (Appendix I contains a summary table showing the DSS breakdown of unsolicited proposals by region and by sponsoring department for the years 1978/79 - 1980/81).

The Statistics Canada figures for contracts from National Defence are much higher than those reported by DSS. This discrepancy can be accounted for by the fact that DSS includes only contracts which are contracted through the Science Centre. Many of DND's, and to a lesser extent other departments' contracts for equipment development requirements are handled by other branches of Supply and Services, and although they may have a large R&D component, they are not now included in the DSS statistics for science contracts.

The large difference between the two sets of figures on contracts from Environment and Fisheries and Oceans is probably accounted for by the fact that a large proportion of the contracts issued by the two departments are for RSA rather than R&D, and are therefore not included in the data from Statistics Canada.

The purpose in presenting statistics from the two statistical sources is to reduce the possibility of drawing erroneous conclusions based on one set of incomplete statistics. While each source gathers similar statistics in some key areas, there are a number of areas where each agency gathers statistics for its own specific requirements. Since both sources of statistics are available to, and frequently used by the private sector, it is important to realize that neither agency's statistics necessarily reflect the overall status of contracting-out.

FEDERAL GOVERNMENT EXPENDITURES ON NATURAL SCIENCE R&D CONTRACTS TO CANADIAN INDUSTRY, UNIVERSITIES AND NON-PROFIT INSTITUTIONS BY DEPARTMENT OR AGENCY
1972-73 TO 1980-81

(Unit = $ 000,000)

DEPARTMENT OR AGENCY	YEAR								
	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81
Communications	11.2	15.4	14.1	10.1	3.9	4.2	4.7	5.1	7.2
Energy, Mines and Resources	0.9	0.9	1.8	2.6	5.2	8.4	6.9	8.2	8.8
Environment	1.9	5.8	6.3	7.4	6.9	9.1	5.1	11.8	12.2
Fisheries & Oceans	0.0	0.0	0.0	0.0	0.0	0.0	6.3	4.7	4.7
National Defence	6.8	5.4	6.7	11.7	13.4	13.7	19.4	29.2	31.7
National Research Council	0.4	1.0	1.9	8.4	25.4	37.2	39.2	27.4	22.8
Supply & Services	0.0	0.0	1.2	6.3	6.8	7.5	10.7	12.4	12.5
Transport	0.8	3.6	1.7	3.0	3.7	6.3	7.0	5.4	4.7
Others	1.9	1.7	1.5	3.7	6.7	7.4	7.1	9.7	12.7
TOTAL *	23.9	33.8	35.2	53.2	72.0	93.8	106.4	113.9	117.3
TOTAL (1974-75 $ Constant)	30.3	38.9	35.2	47.9	59.5	72.2	77.1	74.9	69.4

SOURCES: Statistics Canada, Science Statistics Centre, July 1980
Constant figures from GNE price index in the February 1982 Bank of Canada Review.

* This figure does not include RSA contracts.

MISSION ORIENTED SCIENCE CONTRACTS
AWARDED BY DSS SCIENCE CENTRE[6]

Contracts to Industry (Includes DIPP and Canadian Commercial Corporation Contracts)	1973-74[7]		1974-75[7]		1975-76		1976-77[5]		1977-78		1978-79		1979-80		1980-81	
	Qty	$	Qty	$	Qty	$	Qty	$	Qty	$	Qty	$	Qty	$	Qty	$
National Research Council	6	1,247,992	6	797,024	20	23,673,773	59	33,872,994	176	40,954,018	212	20,732,781	206	26,139,598	199	36,546,381
Fisheries and Environment[1]	204	3,904,401	245	7,149,980	694	19,066,899	654	18,424,275	846	18,303,592	1002	29,977,999				
Environment													464	17,405,205	610	21,661,634
Fisheries and Oceans													513	14,706,529	665	17,827,655
National Defence	45	2,835,405	67	3,022,685	134	6,514,750	100	4,132,329	203	11,097,592	173	8,294,353	178	15,646,532	181	14,056,544
Communications	47	7,457,874	53	5,749,925	139	4,086,262	105	3,703,666	181	6,084,233	170	7,595,453	148	12,694,238	187	10,035,753
Energy, Mines and Resources	64	2,023,434	104	4,624,060	159	8,445,199	193	8,905,980	260	12,178,995	292	16,703,257	286	12,333,629	323	12,121,187
Industry, Trade and Commerce	1	24,213	4	205,083	4	139,593	1	46,950	-	-	7	4,388,020	22	11,518,401	25	16,689,971
Agriculture	2	131,330	4	92,666	94	2,175,697	94	2,811,752	139	3,595,430	155	6,382,229	201	8,613,984	158	6,029,053
Canadian Commercial Corporation	6	1,359,107	3	2,163,419	2	720,187	2	61,840	-	-	1	150,666	14	8,362,653	13	39,416,357
Transport	10	226,547	17	567,152	73	6,740,449	109	6,943,310	103	6,581,738	86	4,713,123	72	7,150,779	73	8,656,331
Atomic Energy Control Board*	2	35,200	3	9,500	13	285,215	31	2,140,900	36	5,659,384	30	5,256,488	19	5,857,401	21	4,353,684
Public Works					-	-	5	89,167	2	182,829	32	608,969	11	2,614,409	14	317,330
Indian and Northern Affairs	3	374,930	7	649,354	20	601,473	22	943,201	26	889,930	19	1,119,696	11	1,546,424	4	273,235
Employment and Immigration[3]					20	774,941	12	540,936	15	579,985	11	272,503	24	1,232,046	21	836,922
National Health and Welfare					8	269,432	7	962,157	9	781,907	13	1,657,627	10	1,054,557	17	3,204,468
Solicitor General											8	1,040,542	5	854,727	16	742,109
Canadian Dairy Commission									14	787,918	4	253,291	9	310,242	8	563,344
National Museums					-	-	1	20,950	-		2	187,464	2	115,954	1	99,900
International Joint Commission			1	6,800	2	58,850	2	39,432	2	18,995	2	26,178	8	87,610	4	10,776
Secretary of State					-	-	3	342,270	9	572,026	4	42,997	1	76,731	3	758,937
Consumer and Corporate Affairs					-	-	1	84,000	-	-	1	319,103	3	67,190	1	14,000
Canadian Transport Commission											1	36,500	1	47,619	-	-
Public Archives	1	10,000	-	-	-	-	1	30,000	-	-	3	123,704	2	47,198	3	66,382
Supply and Services					2	26,500	2	26,500	2	26,699	2	247,500	3	46,135	1	9,000
Revenue Canada					1	27,407	-	-	-	-	(	-	1	11,990	1	10,086
Statistics Canada			1	98,476	1	150,000	1	219,980	2	181,426	-	-	1	10,400	-	-
Post Office			1	188,527	-	-	1	185,896	2	175,593	1	48,770	1	5,686	-	-
Canadian International Development Agency									1	73,870	1	200,000	-	-	1	244,700
Ministry of State for Urban Affairs[2]					11	471,995	-	-	4	73,000	2	117,550	-	-	-	-
Ministry of State for Science and Technology	7	228,545	4	65,355	5	132,995	3	276,711	6	221,835	2	52,900	-	-	-	-
Regional Economic Expansion			3	109,975	1	24,600	-	-	2	1,670	2	10,708	-	-	-	-
Canadian Penitentiary Service					3	244,083	3	71,844	-	-	1	4,886	-	-	-	-
Central Mortgage and Housing					1	12,000	1	17,500	4	182,339	-	-	-	-	-	-
Unemployment Insurance Commission									1	81,950	-	-	-	-	-	-
Justice			1	13,200	-	-	-	-	1	35,000	-	-	-	-	-	-
Public Service Commission					2	100,555	-	-	-	-	-	-	-	-	-	-
Veterans Affairs			1	14,900	1	2,999	-	-	-	-	-	-	-	-	-	-
Classified[4]			7	2,411,857	57	37,622,526	43	4,742,897	39	7,681,979	43	31,007,491				
To Industry	393	19,858,978	532	27,939,938	719	99,664,020	795	76,305,837	1106	97,651,011	1263	116,831,465	1239	119,560,672	1449	165,712,010
To Universities and Non-Profit Institutions	326	3,208,504	374	6,029,701	447	10,294,680	403	10,509,571	548	14,333,834	594	19,679,799	556	23,380,666	556	23,439,312
To Other Performers:	187	1,772,473	230	1,914,531	301	2,609,680	258	2,822,029	434	4,919,018	425	5,309,712	418	5,616,529	502	5,815,342
- Individuals					282	2,238,818	242	2,334,543	397	3,675,676	389	3,753,358	392	3,726,469	484	4,877,225
- Other Governments					19	370,862	16	487,486	37	1,243,342	36	1,556,354	26	1,890,060	18	938,117
GRAND TOTAL	911	25,839,995	1136	35,884,170	1467	112,568,380	1456	89,637,437	2088	116,903,863	2282	141,820,967	2213	148,557,867	2507	194,966,664
GRAND TOTAL (Constant 1974-75 $)		32,708,854		35,884,170		101,412,955		74,080,526		89,926,048		102,768,817		97,735,439		115,364,890

[1] Fisheries and Environment split into separate departments in 1979-80.

[2] Ministry of State for Urban Affairs was disbanded in 1979-80.

[3] Employment and Immigration was formerly Manpower and Immigration.

[4] In 1979-80, it was decided not to include classified contracts separately. They are subsumed in departmental totals for that year. This accounts for the major increase in contracts awarded by IT&C in 1979-80, because contracts under the DIP program were previously listed as classified.

[5] In 1976-77, the contracting-out policy was extended to cover BSA and activities in the human sciences.

[6] Due to amendments of the original contracts, the dollar amounts of the the contracts should be increased by approximately 10% of the original contracts.

[7] Departmental breakdowns for 1973-74 and 1974-75 are for industry contracts only.

SOURCE: DSS R&D Bulletin

TABLE II

6. PRIVATE SECTOR SHARE

In addition to the overall level of R&D being too low, the proportion funded and performed by industry is considerably less than most other western industrialized countries, while the government's share is relatively large in comparison. The planning framework which has been developed to reach the 1.5 percent target seeks to adjust the relative share of industry and government to the point where industry will fund half of the R&D in Canada, the federal government one third, and other governments, universities, etc., the remaining one sixth.

Government expenditures on R&D support industry in two ways. One of the activities which the government funds is support of government missions. This R&D is the subject of the contracting-out policy, and to the extent that these activities are contracted to Canadian industry, they are expected to contribute to the development of Canadian industrial R&D capability. In addition to contracts, however, the government also provides direct funding for industrial R&D in the form of contributions under programs such as IRAP and EDP. Therefore, total government expenditures on industrial R&D are the sum of the contracts and contributions. In moving toward the 1.5 percent target, the government plans to allocate 47% of new federal funds for

research and development to support industrial R&D, and about 32% to mission-oriented R&D.

Chart 1 on page 19 shows the trend in payments to industry for research and development (R&D) and related scientific activities (RSA) for all departments covered by the policy, for the years 1970/71 to 1980/81. Payments are broken down between industrial support program contributions and contracts which cover both R&D and RSA.

It should be noted that the contract figures in Chart I on page 19 are not comparable to those in Table I on page 12. Chart I includes, in addition to R&D contracts, RSA contracts and is restricted to industry contracts. Although Table I includes only R&D contracts, they are contracts issued not only to industry, but also to unversities and non-profit institutions.

The chart indicates that for all but two years (1974/75 and 1978/79) there has been a steady but modest increase in the current dollar value of payments to industry for R&D and RSA. The average annual growth rate for the eleven year period was 9.2 percent. However, when this is considered against the average inflation rate of 8.7 percent (based on GNE Price Index) it is evident that there has been very little growth.

More than three quarters of the current dollar increase in payments to industry was accounted for by an increase in the value of contracts (including unsolicited proposals), which showed an average annual growth rate of approximately 25 percent.

At the beginning of the period, contracts amounted to only 15.8 percent of the value of contributions. By 1980/81, the value for contributions and contracts were in the same order of magnitude, and in 1978/79, contracts actually exceeded contributions by almost $15 million. Contributions have fluctuated within a narrow range and have shown an annual growth rate in current dollars of only 4.3 percent, which works out to a real net decline over the period.

Chart II on page 20 compares the trend in contracts to industry for R&D and RSA with that for federal government in-house expenditures in the same areas, in order to determine whether increased contracting activity has had a significant impact in raising the level of the industrial share in government science activities. The chart indicates that the level of contracts has risen faster than the level of in-house expenditures over the period. The average annual growth rate for contracts was 20.4 percent, while for in-house expenditures it was only 9.2 percent. Contracts accounted for only 6.3 percent of the total mission-oriented science expenditures in 1970/71; by 1980/81 they accounted

for 15.2 percent. This seems to indicate that the contracting-out policy has led to an increase in the industrial share of government science and technology requirements. However, the diagram also shows that the trend of increased contracting vis-à-vis federal government in-house activity has begun to level off.

Table III on page 21 gives the breakdowns (between R&D and RSA) for in-house and contract expenditures. It shows that, with the exception of 1974/75 and 1980/81, the percentage of in-house R&D has fallen each year since 1970/71. The percentage of R&D contracts to industry has risen every year except 1974/75, 1979/80, and 1980/81 starting at 3.9 percent in 1970/71 and levelling off at 16.7 percent in 1978/79, and 16.6 percent in 1979/80 but dropping to 15.7 percent in 1980/81. The percentage of R&D contracts to universities has shown a small but steady increase over the eleven year period, while the percentage of R&D contracts to other performers (i.e., private non-profit institutions, individuals, other governments, and foreign performers) has not shown any clear trend. Industry RSA contracts rose between 1973/74 and 1977/78, but fell back in the last two years. The percentage of university RSA contracts has shown a downward trend, and the percentage of RSA contracts to other performers has increased, but very erratically. It should be noted that a large number of contracts fall into

the gray area of R&D/RSA and the categorization of these contracts is rather subjective.

EXPENDITURES TO CANADIAN INDUSTRY

FOR R&D AND RSA IN THE NATURAL SCIENCES *

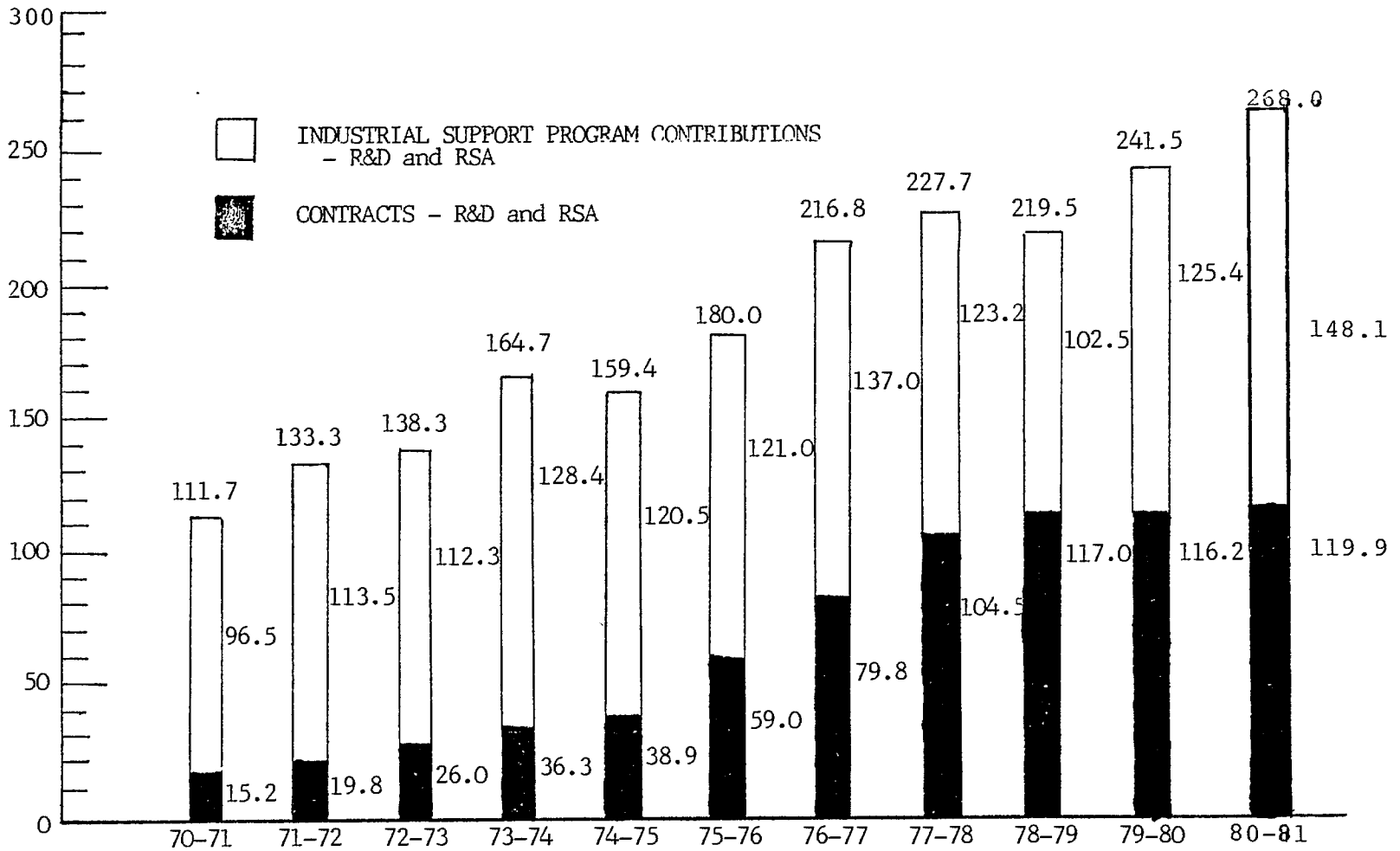


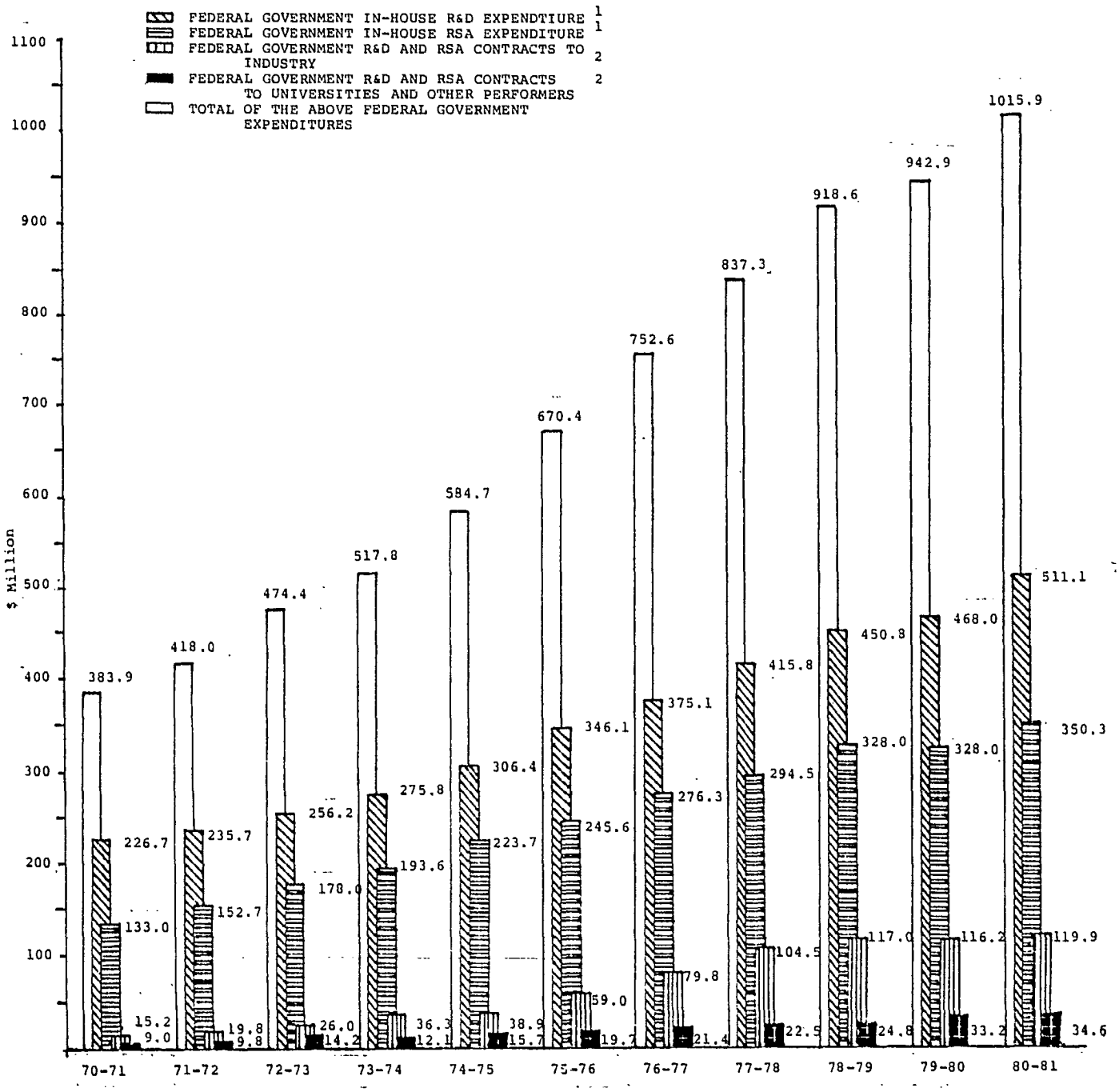
CHART I

* Excludes payments by Atomic Energy of Canada Limited (AECL) which is not covered by the policy.

SOURCE: Statistics Canada, Science Statistics Centre, 1980

CHART II

CURRENT IN-HOUSE EXPENDITURES AND CONTRACTS
TO INDUSTRY, UNIVERSITIES AND OTHER PERFORMERS IN THE NATURAL SCIENCES
(R&D AND RSA)



1. Excludes Atomic Energy of Canada Limited (AECL) entirely, plus all grants to all performing sectors.
2. Data on the actual value of the RSA contracts was only available for the three years 1976/77 to 1978/79. For all other years the value is estimated based on the three year trend.

SOURCE: Statistics Canada, Science Statistics Centre, July 1980

INTRAMURAL AND CONTRACT EXPENDITURES FOR R&D AND RSA IN THE NATURAL SCIENCES[1]

(Unit = $ 000,000's)

	IN-HOUSE		CONTRACTS						TOTAL		PERCENTAGES							
			Industry		University		Other				In-house		Contracts Industry		Contracts University		Contracts Other	
Year	R&D	RSA	R&D	RSA[2]	R&D	RSA[2]	R&D	RSA[2]	R&D	RSA[2]	R&D	RSA	R&D	RSA	R&D	RSA	R&D	RSA
1970/71	226.7	133.0	9.8	5.4	3.9	1.3	1.7	2.1	242.1	141.8	93.6	93.8	4.0	3.8	1.6	.9	.7	1.5
1971/72	235.7	152.7	12.6	7.2	2.5	1.4	2.2	3.7	253.0	165.0	93.2	92.5	5.0	4.4	1.0	.8	.9	2.2
1972/73	256.2	178.0	19.8	6.2	3.5	1.4	5.5	3.8	285.0	189.4	89.9	94.0	6.9	3.3	1.2	.7	1.9	2.0
1973/74	275.8	193.6	29.5	6.8	4.0	1.5	4.6	2.0	313.9	203.9	87.9	94.9	9.4	3.3	1.3	.7	1.5	1.0
1974/75	306.4	223.7	29.9	9.0	5.0	1.4	5.9	3.4	347.2	237.5	88.2	94.2	8.6	3.8	1.4	.6	1.7	1.4
1975/76	346.1	245.6	46.1	12.9	6.1	1.7	7.7	4.2	406.0	264.4	85.2	92.9	11.4	4.9	1.5	.6	1.9	1.6
1976/77	375.1	276.3	64.1	15.7	7.0	2.4	6.7	5.3	452.9	299.7	82.8	92.2	14.2	5.2	1.5	.8	1.5	1.8
1977/78	415.8	294.5	82.4	22.1	8.8	1.3	8.5	3.9	515.5	321.8	80.7	91.5	16.0	6.9	1.7	.4	1.6	1.2
1978/79	450.8	328.0	93.9	23.1	8.8	1.6	9.3	5.1	562.8	355.8	80.0	91.6	16.7	6.5	1.6	.4	1.7	1.4
1979/80	468.0	325.5	97.9	18.3	13.2	2.0	8.9	9.1	588.0	354.9	79.6	91.7	16.6	5.1	2.2	.6	1.5	2.6
1980/81	511.1	350.3	99.7	20.2	14.2	2.9	10.6	6.9	635.6	380.3	80.4	92.1	15.7	5.3	2.2	.8	1.7	1.8

[1] Excludes Atomic Energy of Canada Ltd. which is not covered by the policy.
[2] Data on the actual value of RSA contracts to Industry was only available for the three years 1976-77 to 1978-79. For all other years the value is estimated based on the three year trend.

SOURCE: STATISTICS CANADA, SCIENCE CENTRE, 1980.

TABLE III

7. BALANCE

One of the objectives of the contracting-out policy is to obtain a more even balance between scientific activities performed by the private sector and by the government in support of departmental missions. If only contract expenditures are considered in determining whether this goal is being met, the trend indicates that a better distribution is being achieved. In 1980/81, contracts accounted for 15.2 percent of the total of intramural (in-house) expenditures plus contract expenditures on R&D and RSA compared to 6.3 percent in 1970/71. However, if all extramural expenditures (support programs and contracts) are considered, the results are quite different. Table IV on page 24 shows the trend of expenditures to the private sector as a percent of intramural plus all extramural expenditures for R&D and RSA in the natural sciences (excluding AECL). As can be seen, extramural expenditures have remained between 37 and 42 percent of the total throughout the entire 11 year period. This indicates that the large increase in contracts has been offset by a corresponding drop in the value of contributions until 1980/81, which is also reflected in Chart 1 - Expenditures to Canadian Industry for R&D and RSA. The chart shows that contributions fell from $137 million in 1976/77 to $123.2 million in 1977/78 and $102.5 million in 1978/79 but climbed to $148.1 million in 1980/81. The drop is due primarily to the cancellation of the IRDIA program. The

downward trend in contributions began to reverse itself in 1979/80 as the EDP program began to pick up steam. It should be noted that since the R&D tax incentives are not a budgetary expenditure, they are not included in the tables or calculations.

GOVERNMENT EXPENDITURES ON CONTRACTS AND CONTRIBUTIONS *
AS A PERCENTAGE OF TOTAL
GOVERNMENT EXPENDITURES ON R&D AND RSA IN THE NATURAL SCIENCES

	70-71	71-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81
Contracts to Industry, Universities and Other Performers as a percentage of intramural plus contract expenditures	6.3	7.1	8.5	9.3	9.3	11.7	13.4	15.1	15.4	15.8	15.2
Expenditures on Contributions and Contracts to the Private Sector as a percentage of intramural and extramural payments for R&D and RSA in the natural sciences (excluding AECL)	40.0	41.8	39.8	40.7	38.4	38.5	39.9	40.0	38.6	40.9	37.3

* Contributions include natural science R&D support payments to Canadian industry as reported by the following departments: Communications; Energy, Mines and Resources; Environment; Industry, Trade and Commerce; National Defence; National Research Council; plus a very small amount reported by other departments.

SOURCE: Statistics Canada, Science Statistics Centre

TABLE IV

8. REGIONAL DISTRIBUTION

The 1977 "Policy and Guidelines on Contracting-Out the Government's Requirements in Science and Technology" directed that, as well as attaining the specified science and technology requirement, two other factors must be taken into account in the contracting-out process. One of these factors is the pursuit of other government objectives, such as regional economic expansion, which is to be addressed through regional distribution of contracts rather than a concentration in the two main industrial regions. The other is the creation of an industrial capability in Canada to perform science and technology requirements and reinforce the government's industrial, regional and science strategies.

Table V on page 29 shows the provincial distribution of science contracts awarded by the DSS Science Centre from 1973/74 to 1980/81. The table indicates that for all years except 1978/79, Ontario received between almost one half and two thirds of the total dollar value of contracts. The percentages of contracts awarded (by dollar value) in the Atlantic provinces and British Columbia have increased substantially over the period. The pattern of contracts for the Prairie provinces and for Quebec was erratic over the period and it is difficult to discern a trend.

Table VI on page 30 presents data on the regional distribution. It is expected that the regional distribution of R&D contracting would be directly related to the levels of industrial, and research and development activities by region in the absence of a concerted effort to use contracting-out to move toward the objective of regional economic expansion. Table VI shows the regional distribution of contracts vis-à-vis manufacturing value added, industrial intramural R&D expenditures and federal government expenditures on natural science R&D.

The table shows that for the Atlantic region, the share of contracts is higher than the distribution of manufacturing value added and industrial intramural R&D expenditures, but is lower than the distribution of federal intramural R&D expenditures.

For Quebec, the distribution of contracts is significantly lower than the distribution of industrial intramural expenditures on R&D and manufacturing value added. However, it should be remembered that Quebec is and will be receiving significant industrial benefit offsets which include R&D activities as a result of major government procurements such as the New Fighter Aircraft and the Canadian Patrol Frigate. Also, while Quebec received 17.6% of contracts in 1979/80, it received 25% of R&D grants in 1978/79. Therefore, industrial support programs (i.e.

grants) probably increase federal expenditures in Quebec with respect to R&D.

Ontario is slightly under-represented vis-à-vis all the variables. However, the province still receives about 50 percent of the total value of contracts under the policy.

The West as a whole is over-represented in contracting compared to manufacturing value added, industrial intramural R&D and federal government R&D.

It appears that the distribution of science contracts does not follow exactly the pattern which would be expected based on the regional distribution of these other variables. The Prairie provinces in particular have not experienced any growth on a percentage basis of contracts awarded over the past seven years, although the total value of contracts awarded has more than doubled in the past five years. However, the policy has been of greater benefit to the Atlantic region and British Columbia than to the Prairie provinces and Quebec. This is attributable, in part, to an increase in the establishment of R&D capabilities in the Atlantic and Pacific regions.

It should be noted that while the Contracting-out Policy is required to take into account the regional distribution of R&D, it should be viewed as a supportive rather than a promotional mechanism, since other assistance programs more aptly meet the latter requirement.

PROVINCIAL DISTRIBUTION OF MISSION-ORIENTED SCIENCE
CONTRACTS AWARDED BY DSS SCIENCE CENTRE

REGION	1974-75*			1975-76			1976-77			1977-78			1978-79			1979-80			1980-81		
	Qty	%	$	Qty	%	$	Qty	%	$	Qty	%	$	Qty	%	$	Qty	%	$	Qty	%	$
Newfoundland	5	.2	64,012	12	.2	226,683	10	.5	408,505	18	.5	530,132	27	1.2	1,666,408	45	1.3	1,873,920	70	1.3	2,608,127
Prince Edward Island	-	-	-	3	.3	360,705	1	.2	213,112	6	-	40,777	15	.7	1,008,605	12	.3	387,231	21	0.2	475,398
Nova Scotia	10	.6	162,470	66	3.2	3,612,022	78	3.2	2,861,068	115	2.5	2,944,987	151	4.0	5,647,564	155	3.3	4,867,104	193	2.7	5,247,806
New Brunswick	6	.1	38,225	35	.4	434,182	35	2.0	1,771,763	64	1.1	1,299,902	76	1.4	2,015,809	97	3.0	4,376,050	124	1.3	2,513,713
Quebec	73	27	77532,477	228	22.6	25,428,952	194	11.7	10,492,707	266	20.6	24,094,637	337	34.6	49,050,097	305	17.6	26,204,898	316	20.1	39,215,919
Ontario	290	47	13,118,090	641	61.3	68,998,851	610	64.3	57,615,611	902	54.8	64,057,657	919	38.8	55,002,757	867	49.4	73,424,949	1,066	55.9	108,927,078
Manitoba	7	1	303,325	29	.6	641,248	42	1.5	1,354,925	51	2.6	3,076,700	63	1.6	2,312,151	46	1.5	2,190,061	38	2.0	3,919,558
Saskatchewan	15	3,3	902,442	49	1.6	1,817,408	37	2.8	2,495,835	75	3.0	3,453,005	62	3.2	4,584,956	65	3.6	5,289,492	70	2.2	4,262,671
Alberta	40	5.7	1,582,925	87	2.9	3,207,105	100	4.0	3,590,547	133	5.7	6,624,144	110	2.9	4,097,996	106	4.8	7,166,854	94	2.5	4,806,377
British Columbia	61	11	3,098,587	266	5.6	6,352,784	307	8.3	7,418,518	396	7.6	8,923,795	465	10.3	14,567,924	465	14.5	21,527,695	482	10.8	21,009,127
Yukon, N.W.T.	1	.1	26,833	8	.3	326,961	9	.4	385,001	7	.3	313,371	10	.2	314,118	8	.1	198,963	23	0.2	433,601
Other	25	4	1,092,552	43	1.0	1,098,479	33	1.1	1,029,845	55	1.3	1,544,756	47	1.1	1,552,582	46	.7	1,050,650	60	0.8	1,545,289
TOTAL	532	100	27,939,938	1467	100	112,568,380	1456	100	89,637,437	2088	100	116,903,863	2282	100	141,820,967	2213	100.1	148,557,867	2,557	100	194,966,664

* For 1974-75, only contracts to industry are included, while for other years all contracts are included.

SOURCE: DSS, R&D Bulletin

TABLE V

REGIONAL DISTRIBUTION OF FACTORS POTENTIALLY RELATED TO R&D CONTRACTING ACTIVITY

Region	(% Distribution)			
	Value of Contracts (1979/80)	Manufacturing Value Added (1979)	Current Industrial Intramural R&D Expenditures (1979)	Federal Government Intramural Expenditures - Natural Science (1979/80)
Atlantic	7.7	4.0	3.0	12.2
Quebec	17.6	27.0	25.0	6.1
Ontario	49.4	50.0	52.0	60.0
Prairies	9.9	19.0**	18.0**	13.7
British Columbia*	15.3			8.0
TOTAL	*** 100.0	100.0	100.0	100.0

*Includes Territories and Other.
**Figure is for Prairies and British Columbia combined. Breakdown is not available.
***Figures may not equal 100 due to rounding.

SOURCE: STATISTICS CANADA, SERVICE BULLETIN, SCIENCE STATISTICS; DSS & R&D BULLETIN.

TABLE VI

9. PERFORMANCE IN CANADA

Under the Contracting-Out Policy, Canadian performers, and especially industrial performers, are to be given the highest priority. To determine if these criteria are being met, all contracts awarded over a six month period from May to October 1979 were reviewed. This examination indicates that the overwhelming majority of the work, in the order of 95 percent, is being done in Canada. With regard to performance in industry, statistics show that of the $149.4 million in contracts awarded under the policy in 1979/80, $116.2 million or 77.7 percent went to industrial performers. On the basis of these figures it can be concluded that the criteria of performance in Canada, and industrial performance are being met.

The contracts awarded over the six month period of May - October 1979 were also reviewed to determine the ownership of the contractors. Of the 1,058 contracts awarded over the period, twenty-four percent went to contractors too small to be identified as Canadian or foreign. It can be assumed, however, that most of these contractors are Canadian. Of the remaining 76 percent, 733 or 91 percent went to Canadian-owned performers, and 9 percent went to foreign-owned performers. It therefore appears that over 91 percent of the contracts were awarded to Canadian performers.

10. IN-HOUSE CAPABILITY AND DEPARTMENTAL POLICY ASSESSMENT

The 1976 Evaluation of the Make-or-Buy Policy concluded that between 1972 and 1975 the allocation of human resources to science-based programs had been at a standstill. Table VII on page 36, which provides data on federal employees engaged in R&D in the natural sciences from 1975/76 to 1980/81, indicates that the total number of federal employees engaged in R&D has remained relatively stable. Nonetheless, between 1975 and 1981, total R&D employment fell by 1.6 percent from 15,660 to 15,401. Over the same six year period, intramural expenditures on R&D and RSA rose by 7.8 percent, which was not enough to keep pace with inflation. Furthermore, Table VIII on page 37 shows that federal R&D personnel have been declining not only in absolute terms but also as a percentage of industrial R&D personnel. (Chart III on page 38 graphically represents the decline in the number of government employees in two categories and the minor increase in the third relative to the industry increase in that category.)

Table IX on page 37 gives figures on the employment of R&D personnel in industry over the period 1971 to 1979. In contrast to the employment pattern for government R&D personnel, the number of R&D personnel in industry increased over the period. The increase in the value of government R&D contracts to industry could account for at least part of the

increase in R&D personnel employed in industry. Based on Statistics Canada, revenues of $36,000 were required to support an individual engaged in R&D in industry in 1977. On the hypothetical assumption that the entire increase in the value of contracts to industry between 1971 and 1979 ($101.0 million - Statistics Canada), was in support of R&D personnel, contracting would have created 2,805 person-years of employment in industry. This figure is inflated because of the fact that not all of the funds actually went to support R&D personnel. However, it can be seen that significant increases in employment of R&D personnel have taken place in industry.

Table IX shows that the principal gain in terms of the absolute numbers of industrial R&D personnel employed between 1971 to 1979 was in the manufacturing sector. However this was principally due to the already large size of this sector vis-à-vis R&D personnel. Proportionally, the increase in R&D personnel employed in the manufacturing sector was approximately 19% while the increase in the service sector was approximately 198%. This large proportional increase in service sector R&D personnel is consistent with contracting-out data which point to the increasing importance of the service sector in contracting.

The policy of fiscal restraint which is reflected in relatively little growth in the funding levels and the

number of R&D personnel is a matter of great concern to government departments with science missions. It is felt that the lack of real growth in science budgets has partially reduced the capability of federal departments to respond to new requirements. With regard to contracting-out, many departments said that when the policy was first introduced, it was accepted only with reservations by scientists but after they had some experience with it, they became responsive to it.

Two of the chief complaints by departments about the present handling of the policy are that administrative requirements associated with it are not taken into account when departmental science budgets are set, and that not enough importance is attached to activities related to external contracts in appraising the performance of government scientists. This latter point was made almost universally in spite of the fact that a MOSST report on Technology Transfer from Federal Laboratories to Industry states that all the science-oriented departments now include technology transfer among the criteria included in the performance appraisal of scientists. It appears that although the criterion is included, it is not given sufficient weight vis-à-vis the other criteria to persuade scientists that it is important in the context of their careers.

A further point related to contracting, especially with regard to related scientific activities, is the fact that departments are concerned that they might be criticized for trying to circumvent the government's person-year policies through their contracting activities. There is a potential risk that this view may result in a cutback of contracting activities.

FEDERAL EMPLOYEES ENGAGED IN INTRAMURAL R&D IN THE NATURAL SCIENCES, BY CATEGORY, 1975-76 TO 1979-80[1]

Category	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81
Executive	61	56	55	55	59	61
Scientific and Professional	4,991	5,088	5,066	5,270	5,569	5,654
Administrative and foreign service	442	529	585	599	552	555
Technical	5,149	4,907	4,862	4,763	4,675	4,708
Administrative support	1,777	1,646	1,645	1,765	1,639	1,607
Operational	3,082	3,120	3,009	2,967	2,664	2,658
Military	158	156	160	139	154	158
TOTAL	**15,660**	**15,502**	**15,382**	**15,558**	**15,312**	**15,401**

[1] Excluding employees engaged in the administration of extramural research and development.

SOURCE: SCIENCE STATISTICS CENTRE

TABLE VIII

COMPARISON OF PERSONNEL ENGAGED IN R&D IN GOVERNMENT AND INDUSTRY

Year	Industry	Government*	Government/ Industry (%)
1971	18,951	16,749**	88
1973	19,103	16,322**	86
1975	21,500	15,660	73
1977	21,519	15,382	72
1979	24,620	15,312	62

* The government fiscal year is different from the calendar year used in relation to the industry column (eg. 1971/72).

** Excluding military personnel.

SOURCE: BASED ON DATA FROM SCIENCE STATISTICS CENTRE AND STATISTICS CANADA PUBLICATIONS

TABLE IX

R&D PERSONNEL IN INDUSTRY

Year	Manufacturing	Primary	Service	Total
1971	17,199	677	1,075	18,951
1973	16,666	807	1,630	19,103
1975	18,512	921	2,067	21,500
1977	17,622	806	3,091	21,519
1979	20,430	990	3,200	24,620

SOURCE: BASED ON DATA FROM SCIENCE STATISTICS CENTRE

PERSONNEL ENGAGED IN SCIENTIFIC ACTIVITIES
GOVERNMENT & INDUSTRY (PERSON-YEARS)

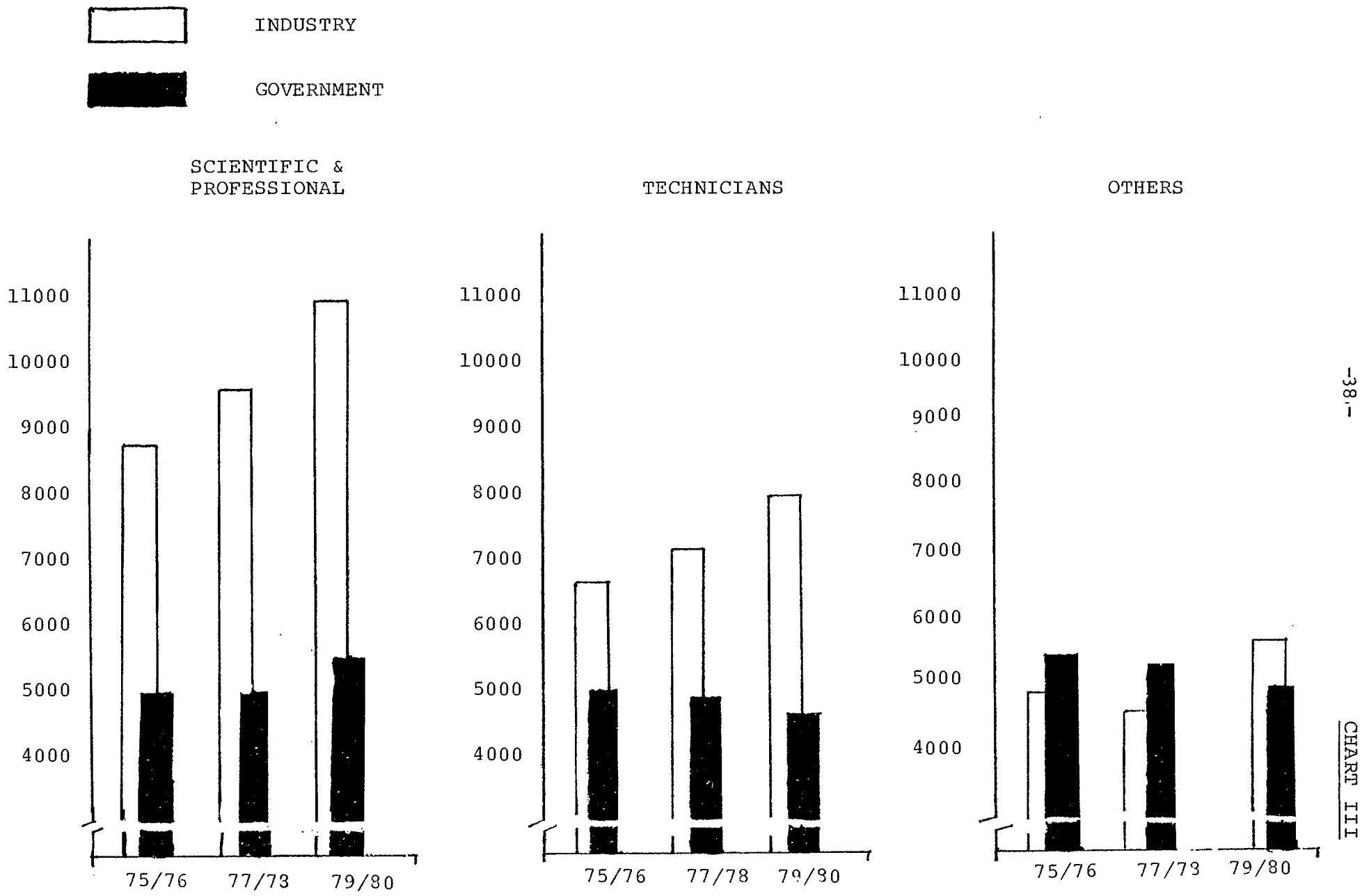


CHART III

11. INDUSTRIAL INNOVATION

An important objective of the contracting-out policy is to provide economic benefit to industry, for example, by stimulating industrial innovation -- i.e., the process of introducing new products and processes based upon the application of science and technology.

In order to evaluate the benefits to industry from the policy it is necessary to establish whether contracts have been successful in resulting in the development and commercialization of technology.

The R&D bulletin published by the Department of Supply and Services, in addition to providing contract statistics, also contains brief summaries of some contracts. The summaries are submitted by DSS Procurement Officers who are asked to describe some of the more successful contracts they have handled. The "success stories" which appeared in the bulletin over the eighteen-month period from April 1979 to September 1980 were examined to see what types of contracts were reported as being successful.

In total, 40 contracts, with a value of $3,349,754 were reviewed. Of these, 17 were directed at the development of new products or processes, while 23 were for studies, surveys, etc.

One of the objectives of the contracting-out policy has been to strengthen companies through the transfer of technology. The policy presently gives priority to industrial firms while universities and non-profit organizations are only considered in the event a capability does not exist in industry. However, it should be noted that universities and non-profit organizations do have equal status when joint proposals are submitted with industry participation. While greater interaction is desirable from a policy perspective, and should be encouraged, it is not considered appropriate to recommend major change to the policy at this time.

Although there were fewer development contracts, they tended to be larger, with an average value of $121,156 compared to $56,091 for the study and survey contracts. As a result, development contracts accounted for $2,059,661 or 61 percent of the total contract value. The innovations developed from the contracts reviewed include several new products and processes applicable to oil spill recovery, a colour image recorder used to convert satellite data into colour pictures, and heat pipes for use in spacecraft and in ground installations such as oil pipelines.

All the above noted factors suggest that the contracting-out policy does have a positive effect on industrial innovation. However, the overall magnitude of the effect, including spin-off and long-term benefits is

extremely difficult to quantify. Quantification would require an extensive analysis of thousands of contracts over a period of time.

Unsolicited Proposals (UP's) play a significant role in the success of the policy. Five of the 17 development contracts, and three of the 23 study or survey contracts originated as unsolicited proposals. UP's accounted for about 25 percent of the total dollar value of the "success stories" reviewed.

12. INDUSTRIAL CAPABILITY

Between 1973/74 and 1980/81, 14,086 contracts, valued at more than $858 million, were awarded by the DSS Science Centre. Eighty-three percent of the contracts, by dollar value, went to industry, while the remaining 17 percent were divided between universities, non-profit institutions, individuals and other governments.

Contracts awarded to industry are differentiated between three sectors; primary, secondary and service. Of the $716 million in contracts awarded to industry since the policy was introduced, almost 55 percent went to the secondary sector, slightly more than 44 percent to the service sector, and less than one percent to the primary sector. In terms of number of contracts, there were four times as many service sector contracts as secondary industry contracts, but the average value of the secondary industry contracts was five times higher.

Although contracts to secondary industry have accounted for the largest share of total industry contracts over the life of the policy, during the 1979/80 fiscal year the total value of service sector contracts exceeded that of secondary industry contracts (Figure 1 on page 46). In 1980, the total value of secondary industry contracts once more exceeded the value of service sector contracts. The preponderance of

secondary industry contracts probably was due to the Remote Manipulator System (RMS) Program contracts. The reasons for, and implications of the overall pre-eminence of secondary industry in the contracting-out process are not entirely clear. It may be that by 1977 the departments were already contracting-out most activities which would be of interest to secondary industry and the only way to increase contracting substantially was through the contracting of service type activities. R&D expenditures throughout the service sector have been growing more rapidly than in the primary or secondary sectors until 1980/81. The contracting-out statistics thus tend to reflect a growing capability to perform research in the service sector.

On the basis of feedback provided to DSS by contractors upon the completion of their contracts, indications are that small and medium-sized companies benefit most from the policy. Although large companies do perform contract work from time to time, their participation rate is nowhere near what would be expected on the basis of their predominant role as performers of R&D in Canada. One reason for this phenomenon is that large companies tend to be less flexible. They have their own carefully planned research programs and are not interested in doing contract work unless it fits in very closely with their own objectives.

By far the largest, single beneficiary of the policy is SPAR, which has received more than $144 million, or almost 20 percent of the total value of all contracts. $132 million of the money awarded to SPAR was for the Remote Manipulator System (RMS) program, while the other $12 million was for various satellite programs.

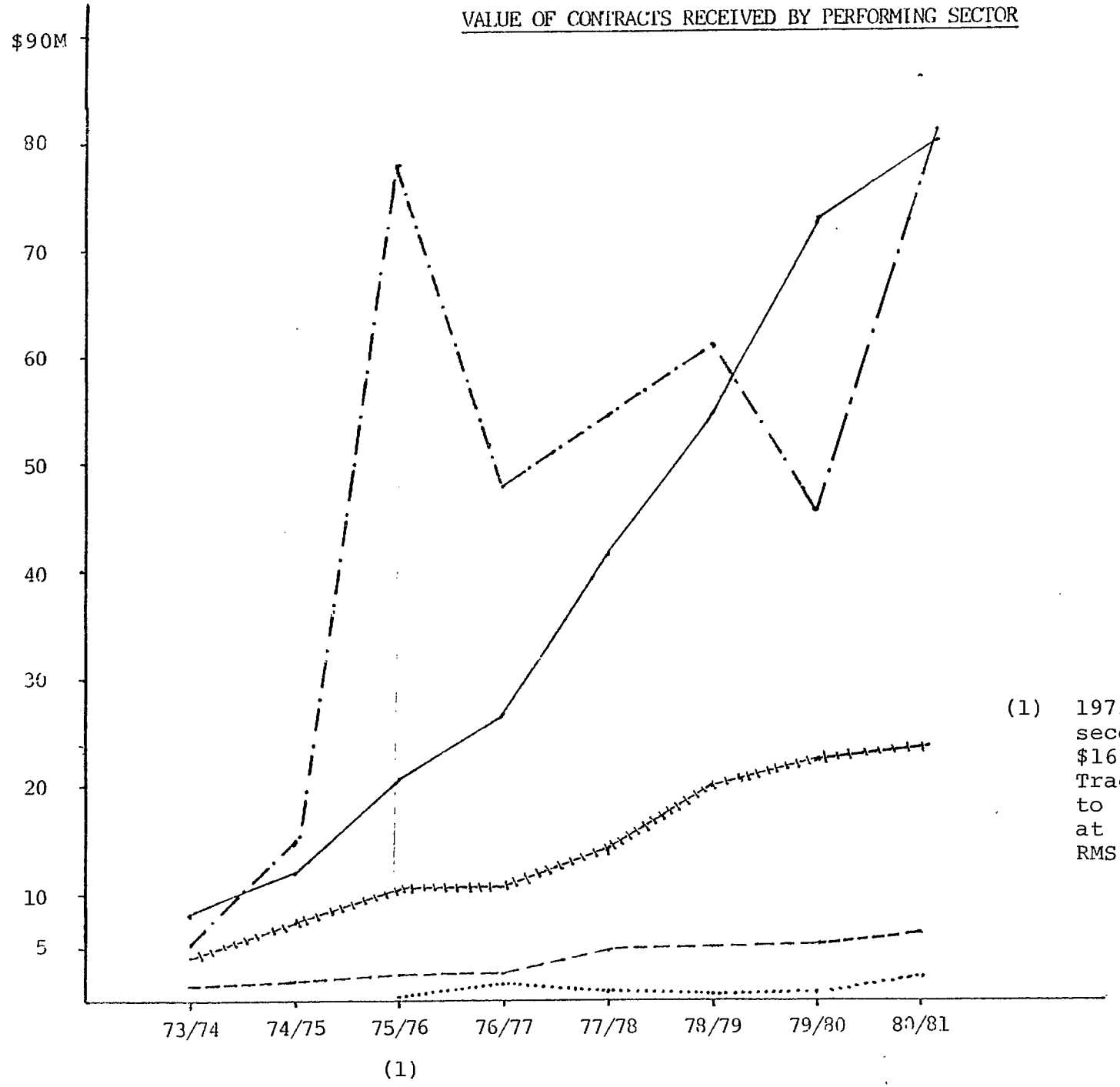
In addition to SPAR, several other companies, some of which are small Canadian-owned firms, have used the policy to develop unique capabilities which are either now being marketed internationally, or have bright prospects. Among the companies in this group are MacDonald Dettwiler, which had developed portable ground stations for satellite information; Innotech Aviation, which developed a capability to carry out the airborne program of the Canada Centre for Remote Sensing (CCRS); Hermes, which developed an ocean data buoy system; and Canadian Astronautics, which developed a local user terminal for the search and rescue satellite SARSAT. These four companies received total contracts worth $11,713,080 for the projects described above. Canadian Astronautics, as a result of expertise gained from government contracts, won a contract to supply almost $3.5 million of terminals to NASA.

The Department of Supply and Services has followed up on companies participating in the Unsolicited Proposal (UP) Program and has found that as a result of completing UP

contracts, firms have identified actual and anticipated follow-on work amounting to $9.00 of new work for every dollar expended by the government in the original UP contract. The new work generated from UP's is likely to be higher than for contracting-out as a whole because in UP's the companies actually propose the projects.

Under the contracting-out policy, the Crown usually retains ownership of intellectual property rights arising out of contracts performed by private sector companies but the companies are able to obtain licenses which enable them to commercialize technology developed through contracts. In the first years of the program there was very little interest in licensing inventions arising out of the contracts. Between 1973 and 1977 only two licenses were awarded. Since 1978 interest has increased, with nineteen licenses awarded from 1978 through the first six months of 1980. However, this is not considered to be a good or even realistic indication of the success of the policy as companies are often able to exploit the know-how or technology acquired from contracts without having to obtain government licensing.

This is confirmed by the Department of Supply and Services, which is currently engaged in a exercise aimed at reviewing the government's policy respecting ownership of intellectual property arising out of government contracts.



(1) 1975-76 contracts to secondary industry include $16.5 million in RMS con-Tracts. 1980-81 contracts to secondary industry include at least $30 million in RMS contracts.

FIGURE 1

HISTORICAL TREND IN CONTRACTS BY INDUSTRY SECTOR

	73/74	74/75	75/76	76/77[1]	77/78	78/79	79/80	80/81	Totals 73/74 80/81
Total Contracts									
Value	$ 18,866,916	$ 35,036,536	$112,568,380	$ 89,637,437	$116,903,863	$141,820,967	$148,557,867	$194,966,664	$858,358,630
#	891	1132	1467	1456	2088	2282	2213	2557	14086
Industry Contracts									
Value	12,928,231	27,088,018	99,664,020	76,305,837	97,651,011	116,831,465	119,560,672	165,712,010	715,741,264
#	390	528	719	795	1106	1263	1239	1449	7489
Primary									
Value	79,133	107,286	491,295	1,455,033	945,624	842,532	856,216	2,014,604	6,791,723
#	2	8	18	18	16	17	13	11	103
Secondary									
Value	5,434,446	14,774,077	78,457,523	48,083,297	54,979,982	61,208,303	45,917,931	82,120,921	390,976,480
#	137	164	219	178	236	216	153	128	1431
Service									
Value	7,414,652	12,206,655	20,715,202	26,767,507	41,725,405	54,780,630	72,786,525	81,576,485	317,973,061
#	251	356	482	599	854	1030	1073	1360	6005

(1) In 1976/77 the contracting-out policy was extended as noted previously.

SOURCE: DSS R&D BULLETIN

TABLE X

13. IMPACT OF 1976 POLICY EXPANSION

In 1976 the policy was expanded to include the following:

- ongoing as well as new science and technology requirements

- related scientific activities (RSA) such as data collection

- science and technology requirements in the human and social science fields of urban, regional and transportation studies

- unsolicited science and technology proposals to meet "any priority government requirement".

Table XI on page 50 compares federal expenditures components on R&D in the natural sciences. Expenditures in the areas of total federal R&D, contracted-out R&D, in-house R&D and R&D grants are compared for the period 1976-77 to 1981-82. During this period the value of contracted-out R&D increased by 105% as compared to a 79.3% increase in total federal R&D, a 91.3% increase in R&D grants and a 66.6% increase in in-house R&D. The 66.6% increase in in-house

represents for the most part inflation since there was very little change in the number of R&D person years for this period.

From the information contained in Table XI, it is clear that a trend exists in which contracted-out R&D is increasing as a percentage of in-house R&D. On the other hand contracted-out R&D as a percentage of total federal R&D expenditures is holding relatively steady at slightly more than 11%.

It has not been possible to quantify the impact that the 1976 policy expansion has had with respect to the overall increase of 105% in contracting-out activity for the period. However, based on available data, it would appear that the impact has been rather limited.

In the case of the contracting-out of on-going science and technology requirements there is little evidence, based on the nature of the issued contracts, that the policy has led to a significant increase in the amount of R&D that has been contracted-out. This is, to a degree, understandable since it is a natural instinct to wish to maintain complete control over a R&D project due to past personal involvement.

The inclusion of related scientific activities has had some impact with respect to increasing the total dollar value

COMPARISON OF FEDERAL GOVERNMENT EXPENDITURES ON R&D IN THE NATURAL SCIENCES 1976-1982

YEAR	$ 000,000				IN-HOUSE AS % OF TOTAL	GRANTS AS % OF TOTAL	CONTRACTS AS % OF TOTAL	CONTRACTS AS OF % IN-HOUSE
	TOTAL FEDERAL R&D EXPENDITURE	IN-HOUSE FEDERAL R&D EXPENDITURE	FEDERAL R&D GRANTS	FEDERAL R&D CONTRACTS				
1976-77	855.6	375.1	297.2	86.2	43.8	34.7	10.1	23.0
1977-78	918.0	429.6	300.6	104.0	46.8	32.6	11.3	24.2
1978-79	1,011.2	471.9	300.0	120.2	46.7	29.7	11.9	25.5
1979-80	1,084.4	481.3	356.3	129.5	44.4	32.9	11.9	26.9
1980-81	1,240.0	528.1	433.7	134.7	42.6	35.0	10.9	25.5
1981-82 (estimated)	1,533.9	609.8	568.5	176.9	39.8	37.1	11.5	29.0
PERCENTAGE INCREASE 1976-82(1)	79.3	66.6	91.3	105.0				

(1) The inflation rate based on the GNE price index from 1976 to 1982 was approximately 58%.

(2) The column on grants is included to indicate that it is a significant component of Total Federal R&D Expenditure.

SOURCE: FEDERAL SCIENCE EXPENDITURES AND PERSONNEL

TABLE XI

of contracted-out S&T since there has been an increase in the number of contracts designated as RSA. However, overall the impact is considered to be relatively minor due to the generally low individual and total contract value for RSA contracts. Also, there are a large number of contracts which are difficult to categorize due to the inclusion of both R&D and RSA elements in them.

The inclusion of science and technology requirements in the human and social science fields of urban, regional and transportation studies has had little if any impact on the growth of contracting-out in light of the small number of contracts awarded in these fields.

In the case of unsolicited science and technology proposals to meet "any priority" government requirement, the expansion of the policy to include "any priority" government requirement has undoubtedly been a factor in encouraging the private sector to submit a greater number of proposals. However, since funds in support of this program are limited to $15 million per year this factor influences the qualitative aspects of the program rather than the quantitative value of the program.

On the basis of the above it does not appear that any particular area of the 1976 expansion has played a major role in the 105% increase in contractual volume during this

period. In view of this it can be concluded that the contracting-out of new science and technology requirements is the corner stone of the policy and will continue to be the major factor on which growth is based in future years.

14. CONCLUSIONS

The Contracting-Out Policy was implemented to obtain an increase in the scientific activities performed by industry for the government through the contracting-out of science and technology requirements in support of departmental missions, thereby stimulating industrial innovation.

If the success of the policy is judged solely on the actual increase in the contracting-out of scientific activities between 1971 and 1981 ($10 million to approximately $200 million), the policy is achieving its prime objective since the private sector is now participating to a much greater degree in the fulfillment of government departments' scientific missions.

A factor which is almost as important as the statistics in determining the ultimate effectiveness of the policy is the degree to which both the public and private sectors perceive that it is fulfilling their goals and objectives. The private sector generally views the policy as a positive indication of the government's intent that industry should become more deeply involved in the achievement of the government's scientific objectives. However, it is concerned that the departments' interpretation of their role or mission is, in some cases, different than the private sector's interpretation.

Industry, to a large extent, believes that the role or mission of government departments, is to complement industry's aspirations, whereas the departments view industry's role as being to satisfy government requirements. As a consequence, there are times when the Contracting-Out Policy is criticized due to the differing interpretation of responsibilities by either or both parties.

Notwithstanding the above, the objective of the policy is quite explicit. It states:

> Since the government has many science and technology requirements to meet in support of departmental missions, its policy of contracting-out these requirements reflects its belief that it is in the national interest to encourage the fullest possible participation of Canadian industry in meeting these needs, to stimulate industrial innovation and thus provide additional benefits to the economy.

Based on an analysis of contracted-out activities and limited interviews with representatives of various government departments, it would appear that the policy is being implemented conscientiously by departments. In general,

departments are becoming less reluctant to contract out as they become more aware of the potential opportunities offered by the policy. When the contracting-out policy was originally introduced, and for some time thereafter, departments tended to confuse it with the general policy of fiscal restraint, with the result that undesirable outcomes such as lack of growth in research funding and personnel, which were in fact caused by the restraint policy, tended to be blamed on the contracting-out policy. However, this misconception is gradually disappearing and government departments are beginning to appreciate that the contracting-out policy has been subject to the same fiscal contraints as other areas.

A number of departments have expressed concern over the fact that no budgetary or manpower compensation exists for the use of internal resources required to support and monitor R&D contracted-out. Concern was also expressed that there was little recognition given to the efforts of government scientists for the administration of contracted-out R&D projects. As a consequence, it was felt that both intramural and extramural R&D were suffering since the available manpower tended to be spread thin.

The level of increase in R&D being contracted-out since 1976/77 is approximately 105% which is in line with the rate of inflation, except for 1981/82 which shows a significant increase due to the introduction of new R&D programs such as

the energy program. This would tend to indicate that a levelling-off occurred between 1976/77 and 1980/81 in that, with few exceptions, departments had identified and were contracting-out their activities which were within the purview of the policy. However, on the basis of contract activity in 1981/82 and forecast activity for 1982/83, a significant increase in contracting-out should take place in the next few years, due to programs such as the energy program, with a subsequent levelling off.

A key question which has been of major concern to departments since the advent of the contracting-out policy has been whether or not the policy would eventually lead to an erosion of the government's in-house capability. While it is not apparent that major erosion has taken place, and in most cases departmental representatives are reluctant to admit to any erosion due to the possible suggestion that departmental missions are not being met, it is probably valid to assume that since in-house scientific manpower has not increased significantly while contract administration responsibilities have increased, the overall in-house scientific capability has remained constant or decreased slightly over the past six years. On the other hand, the increased input from the private sector should mean that the overall mission-oriented capability has not decreased and may, in fact, be improved.

In the course of limited discussions with departmental representatives and companies concerning the effectiveness of the policy, it became apparent that a great many of the problems which were identified as being related to the contracting-out of R&D were in fact not attributable to the policy, but were beyond the scope of the policy. The problems identified were usually administrative in nature, and in many cases, were a result of either internal departmental policies or the various financial and contracting regulations which govern government contracting. Examples include a ceiling on per diem rates, etc., and long delays caused by departmental policies requiring approval at several levels and the general inability of the government to quickly respond to the private sector's needs.

Notwithstanding the justified or unjustified criticisms of the policy, the Unsolicited Proposal (UP) Program is considered by science departments to be one of the most effective government programs for stimulating innovation in the private sector. The consensus of science departments is that it is one of the most effective mechanisms for informing government scientists of the capabilities which exist in the private sector while, at the same time, acting as a stimulus to the private sector to become informed of the direction of scientific work within the government, and to some extent to influence the direction. It has also been an effective

leverage mechanism to encourage mission-oriented departments to contract more of their science budgets with industry.

It is generally agreed that the UP program is being administered in an effective and efficient manner by the Department of Supply and Services. However, an irony exists in that deparmental representatives generally believe the proposal acceptance criteria to be too liberally applied for proposals of interest to other departments and too stringently applied for proposals of interest to their own department.

In summary, the philosophy of the Contracting-Out Policy has generally been accepted as an effective means of achieving the government's objective of obtaining a better distribution in technological work performed by the public and private sectors. It has also helped to increase industrial innovation, and industrial R&D capability and has had a positive impact on the level of R&D performed in both the Atlantic region and in British Columbia. Further, it appears to have stimulated increased R&D employment in industry.

The key factor which would appear to have limited a more rapid expansion and fuller utilization of the policy is the government's financial constraints on departmental science budgets. These constraints had an impact because increases

in departmental science budgets usually are reflected by an increase in contracting-out activity. The increase in contracting-out activity as a result of increased budgets in 1981-1982 tends to confirm that the level of contracting-out activity is directly related to increases in science budgets.

While it is a common complaint, in view of the tight budget situation, that there are insufficient funds for departments adequately to keep up their in-house expertise, it is generally agreed that should additional funds be made available, the departments would use them to contract out R&D to the private sector.

Finally, during the course of performing this evaluation it became clear that some improvements could be made in the appropriate statistics. The goal of these improvements would be the creation of a standard set of quantitative data for future analysis. Therefore, recommendations have been made to take this into account.

15. RECOMMENDATIONS

With regard to the future course of the policy, the following recommendations are proposed:

1) A biennial audit of departmental scientific activities be carried out by the Treasury Board for the next six years to verify that departments are adhering to the guidelines of the policy and are justifying in-house activities in accordance with the criteria detailed in the policy; the requirement for annual reports by the Ministry of State for Science and Technology on the impact of the policy be cancelled.

2) The establishment of a mechanism whereby departments would receive some form of compensation, in terms of person-years, to acknowledge that contracting-out requires monitoring and integration of the contract results into the department's normal activity.

With regard to the collection of contracting statistics, the following recommendations are made:

With regard to the collection of contracting statistics, the following recommendations are made:

3) Statistics on science contracts which are not going through the Science Centre, but are being handled by other branches of DSS, should be gathered by the Science Centre.

4) Statistics concerning science contracts issued directly by departments should also be gathered by the Science Centre. (All S&T contracts covered by the contracting-out policy should be issued by DSS in accordance with the policy.)

5) The practice of separating contracts awarded under the federal contracting-out policy from "other S&T Programs" in the provincial distribution was begun in April 1981. This is welcomed, and the figures should be further improved by the inclusion of a provincial distribution of science contracts issued by other departments and other branches of DSS.

6) The monthly statistics published by DSS should also provide a separation of R&D and RSA contracts. This is useful information for understanding the benefit of the policy.

With regard to the administration of the Contracting-Out Policy, it is recommended:

7) That any specific difficulties related to procurement procedure be brought to the attention of the Department of Supply and Services, and subsequently to the Treasury Board Advisory Committee on Contracts.

APPENDIX I

SUMMARY OF UNSOLICITED PROPOSALS STATISTICS 1978/79 - 1980/81

		1978/79	1979/80	1980/81
Proposals Received		658	540	549
$ Value of Proposals		131,453,962	82,859,838	105,215,066
Contracts Issued		186	186	206
$ Value of Contracts		19,363,343	25,530,975	24,534,103
Contracts Awarded				
Atlantic	#	20	14	27
	$	2,434,844	2,230,615	2,486,032
Quebec	#	29	41	40
	$	2,392,362	5,674,104	3,302,667
Ontario	#	89	94	112
	$	10,685,178	11,495,438	14,174,866
Prairies	#	23	17	11
	$	1,633,472	1,674,013	3,221,242
B.C. & Territories (Pacific)	#	25	20	16
	$	2,217,487	4,456,805	1,353,296

DEPARTMENTS SPONSORING UNSOLICITED PROPOSALS	1978/79	1979/80	1980/81
Environment		42	30
Fisheries & Oceans		23	30
Fisheries & Environment*	67		
Communications	12	16	15
Energy, Mines and Resources	26	22	34
Agriculture	25	29	21
Transport	10	10	26
National Health and Welfare	5	8	7
National Research Council	9	14	26
National Defence	11	10	7
Industry, Trade & Commerce	2	1	2
Indian & Northern Affairs	3	1	-
National Museums	2	2	1
Solicitor General	-	1	2
Employment & Immigration	-	1	-
Secretary of State	-	1	2
Canadian Transport Commission	1	1	-
Atomic Energy Control Board	3	1	2
Public Works	6	1	1
Consumer & Corporate Affairs	1	1	-
Canadian Dairy Commission	-	1	-
National Capital Commission	1	-	-
Supply & Services	1	-	-
Post Office	1	-	-

* Fisheries & Environment separated into two departments after 1978/79

SOURCE: DSS Science Centre