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PUBLIC SERVICE DEATH BENEFIT ACCOUNT

ACTUARIAL REPORT

AS AT DECEMBER 31, 1989

TABLE OF CONTENTS

	<u>Page</u>
I. Introduction	1
II. Summary of Valuation Results	2
III. Valuation Balance Sheet	4
IV. Projection of the Cost of Benefits	5
(A) Current Cost (Year 1990)	
(B) Long-term Cost (Year 2050)	
V. Projection of Contingency Reserve	8
VI. Reconciliation of Projections of Cost and Contingency Reserve in this Report with those in the Previous Report	10
VII. Data and Acknowledgements	12
VIII. Actuarial Opinion	13

APPENDICES

1. Summary of Supplementary Death Benefit Plan	14
2. Description of Actuarial Methods and Assumptions	17
3. Tables Displaying Various Assumptions	22
4. Participants' Displays	26

PUBLIC SERVICE SUPERANNUATION ACT - PART II

Report on Actuarial Examination of the Public Service Death Benefit Account in the Consolidated Revenue Fund as at December 31, 1989

I. Introduction

Part II of the Public Service Superannuation Act (PSSA) entitled "Supplementary Death Benefits" provides for life insurance to participants. Contributions in respect of these benefits are made to the Public Service Death Benefit Account, and death claims are charged against the Account.

This actuarial report has been prepared in accordance with section 59 of the PSSA. As required, the report contains an estimate of the extent to which the amounts standing to the credit of the Account and the contributions payable under Part II of the PSSA are sufficient to meet the benefits chargeable against the Account.

The previous actuarial report was done as of December 31, 1986. During the period from January 1, 1987 to December 31, 1989, there were no changes to the benefit or contribution provisions of the plan. The provisions are summarized in Appendix 1.

II. Summary of Valuation Results

The total number of participants* as at December 31, 1989 in the Supplementary Death Benefit Program was 398,551 of whom 302,178 were employed participants, 96,159 were elective participants entitled to an immediate annuity**, and 214 were elective participants not entitled to an immediate annuity. The total amount of benefits in force as at that date was \$12,021.5 million.

We estimate the effective cost of benefits in 1990 (other than the \$500 paid-up coverage) for employed and elective participants who are entitled to an immediate annuity on ceasing to be employed in the Public Service to be \$0.235 per month per \$1,000 of benefit in force. In respect of the estimated benefits of \$12,364.8 million in effect during 1990 for this group of participants (excluding the \$500 paid-up coverage), the 1990 cost is estimated to be \$34.9 million ($\$12,364.8 \text{ million} \times 0.235 \times 12 / 1,000$). Including the \$500 paid-up coverage paid by the government, the total 1990 cost of benefits is estimated at \$36.5 million.

The monthly cost per \$1,000 of benefits in force is expected to increase gradually to a level of approximately \$0.253 by 2008, and thereafter to decrease gradually to \$0.146 by 2050. These changes in estimated costs arise primarily from the expected reduction in future mortality (which reduces costs), from an increase in the proportion of female participants (which reduces costs), and also from an increase in the proportion of total coverage attributable to elective participants (which increases costs).

Employed and elective participants entitled to an immediate annuity are required by statute to contribute \$0.40 per month per \$1,000 of coverage, and the government contributes an amount equal to one-sixth of the cost of claims in respect of employed and elective participants entitled to an immediate annuity. In 1990 it is estimated that this latter amount will be \$0.039 per month per \$1,000 of benefit. Therefore, the total amount contributed in respect of employed and elective participants entitled to an immediate annuity is \$0.439 per month per \$1,000 of coverage, as compared to the estimated monthly cost of these benefits in 1990 of \$0.235 per \$1,000 of insurance.

The government as employer also pays, on attainment of age 65, the single premium in respect of the \$500 paid-up benefit to employed participants and to elective participants entitled to an immediate annuity. In addition, as the fiduciary of the Account, the government pays the interest on the balance in the Account.

* See Appendix 1 for definitions of the various categories of participants.

** Throughout this report, the expression "entitled to an immediate annuity" excludes entitlement to an immediate reduced allowance as well as entitlement to a deferred annuity.

The contingency reserve in the Public Service Death Benefit Account was \$573.0 million as at December 31, 1989, or about 15.7 times the total amount of benefits estimated to be payable from the Account in 1990. Moreover, the total contributions in 1990 by and in respect of all participants are expected to be about 1.8 times the total amount of benefits estimated to be payable from the Account in 1990.

By comparison, the contingency reserve at the previous valuation, at December 31, 1986, was \$338.6 million, or about 10.2 times the amount of benefits payable from the Account in 1987. In the report on the previous valuation, the total contributions for all participants in 1987 were estimated to be 1.6 times the total amount of benefits payable from the Account in that year.

Without any change in the benefit and/or contribution provisions of the plan, the contributions, excluding interest credits, are expected to exceed charges in all future years (see Section IV). This excess together with the interest credits would result in an ever-increasing contingency reserve, whether expressed as a dollar amount or as a multiple of the annual expected benefits payable from the Account (see Section V). This resulting contingency reserve would be considered an excessive provision for any adverse experience fluctuations that are likely to occur in the future.

The actuarial methods and assumptions on which the results shown in this report are based are described in detail in Appendix 2.

III. Valuation Balance Sheet

The following balance sheet shows the state of the Public Service Death Benefit Account as at December 31, 1989:

<u>Assets</u>	(\$ millions)
Balance of Account	576.6
Contributions and interest due	<u>18.2</u>
Total assets	594.8
 <u>Liabilities and Contingency Reserve</u>	
Actuarial liability for the \$500 paid-up benefit for participants at age 65 or over who are employed in the Public Service or entitled to an immediate annuity	15.7
Actuarial liability for elective participants not entitled to an immediate annuity	0.1
Reserve for claims incurred but unreported or reported but not paid	<u>6.0</u>
Total liabilities	21.8
Contingency reserve	<u>573.0</u>
Total liabilities and contingency reserve	594.8

IV. Projection of the Cost of Benefits

A. Current Cost (Year 1990)

The 1990 cost of claims for employed and elective participants entitled to an immediate annuity, estimated at \$0.235 per month per \$1,000 of insurance, is supported by statistics included in recent published annual reports on the administration of the PSSA. The annual reports for the nine years ending March 31, 1990 indicate that the average monthly claim payments varied between \$0.239 and \$0.294 per \$1,000 of coverage.

These statistics also indicate that the costs tend to decrease over time. The monthly claim payments per \$1,000 of benefit coverage, averaged over six years, are shown below:

<u>Six Years Ended March 31</u>	<u>Average Monthly Claims per \$1,000 of Benefit</u>
1988	.264
1989	.255
1990	.248

Since monthly contributions from participants, together with government credits, are currently about \$0.439 per \$1,000 of benefit for employed and elective participants entitled to an immediate annuity, there continues to be an excess of current contribution income over benefits going out. This excess has been the main reason for the accumulation of what must now be regarded as a very large contingency reserve, a matter discussed further in Section V.

B. Long Term Cost (Year 2050)

The following table illustrates the projected monthly cost per \$1,000 of benefit in force for selected years from 1990 to 2050.

Projected Cost (Monthly) per \$1,000 of Benefit in Force*

<u>Category of participants</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>	<u>2025</u>	<u>2050</u>
Employed participants	\$0.158	\$0.165	\$0.155	\$0.124	\$0.091
Elective participants entitled to an immediate annuity	\$1.190	\$1.022	\$0.804	\$0.720	\$0.531
Employed and elective participants combined	\$0.235	\$0.241	\$0.251	\$0.195	\$0.146

For employed participants, the estimated monthly cost in 2050 is expected to be 42 per cent smaller than the estimated monthly cost in 1990. This is the result of three factors:

- 1) There is a significant reduction in cost due to the low mortality anticipated in 2050 in accordance with the projection factors shown in Appendix 3D applied to the current mortality rates shown in Appendix 3A. (The projection factors shown in Appendix 3D reflect the anticipated future reductions in mortality.)
- 2) Additionally, there will be a small reduction in costs resulting from a change in the proportion of employed participants' insurance coverage attributable to males, from 64 per cent in 1990 to a level of 62 per cent in 2050.
- 3) The distribution of employed participants in the year 2050 is weighted more heavily at the older ages than the current population. This has the effect of increasing the cost. However, this increase is more than offset by the expected low mortality in 2050.

* Benefits in force include benefits (other than \$500 paid-up coverage) for employed and elective participants who are entitled to an immediate annuity on ceasing to be employed in the Public Service. Participants contribute at the rate of \$0.40 per month per \$1,000 of benefits coverage, regardless of age.

For elective participants entitled to an immediate annuity, the estimated monthly cost in the year 2050 is expected to decrease by approximately 55 per cent from the estimated 1990 monthly cost. This reduction is almost entirely the result of the very low mortality anticipated in the year 2050.

The combined effect for employed and elective participants entitled to an immediate annuity is an expected decrease in the monthly cost in the year 2050 of 37 per cent compared with the 1990 costs. The proportion of coverage on elective participants (who carry a much higher cost) will substantially increase from 8 per cent in the year 1990 to 13 per cent in the year 2050.

Elective participants not entitled to an immediate annuity pay contributions dependent on the age at cessation of employment. See Appendix 1 for the schedule of rates at selected ages.

V. Projection of Ratio of Contingency Reserve to the Cost of Benefits

The contingency reserve of \$573.0 million at December 31, 1989 was equal to about 15.7 times the benefits payable from the Account in 1990. For the existing plan, this reserve is expected to grow indefinitely and is more than adequate to offset adverse fluctuations.

The table below illustrates the projected ratio (for selected years from 1989 to 2050) of the contingency reserve to the annual benefit payment in the following year. The table shows the ratios on the basis of different contribution rates, with any changes in rates assumed to be effective January 1, 1992.

<u>Assumed Monthly Contributions per \$1,000 of Benefit</u>	<u>Projected Ratio of Contingency Reserve to Annual Benefit Payments in Following Year</u>				
	<u>1989</u>	<u>2000</u>	<u>2010</u>	<u>2025</u>	<u>2050</u>
\$0.40*	15.7	38.5	53.4	104.4	239.9
0.20*	15.7	30.1	35.5	59.9	120.9
0.05*	15.7	23.5	21.3	23.2	24.3
0.08**	15.7	23.1	20.4	21.1	20.7

This table suggests that the monthly contribution rate for participants could be reduced to \$0.05 per \$1,000 of benefit with the government paying one-sixth of benefits, or to a combined government-participant contribution rate of \$0.08, effective January 1, 1992, with reasonable expectation that a substantial contingency reserve will be maintained at least until the year 2050.

The contingency reserve could also be reduced by increasing the amount of paid-up insurance when participants attain age 65 or by increasing the amount of basic coverage. For example, if the amount of paid-up insurance is increased (effective January 1, 1992) from the current \$500 to \$5,000, the projected ratio of the contingency reserve to the annual benefit payment in the following year would be as follows:

<u>Assumed Monthly Contributions per \$1,000 of Benefit</u>	<u>Projected Ratio of Contingency Reserve to Annual Benefit Payments in Following Year</u>				
	<u>1989</u>	<u>2000</u>	<u>2010</u>	<u>2025</u>	<u>2050</u>
\$0.40*	15.7	24.1	36.8	75.7	191.1
0.20*	15.7	17.6	21.6	35.6	78.0

* This rate is assumed to be paid by participants; in addition, government credits to the Account are assumed to be equal to one-sixth of benefits paid subject to uniform contributions.

** Assumed total contribution from participants and government combined.

Another approach to reduce the contingency reserve would be to increase the amount of paid-up insurance from the current \$500 to \$5,000 and to double the basic benefit from one times salary to two times salary. The projected ratio of the contingency reserve to the annual benefit payment in the following year would be as follows:

<u>Assumed Monthly Contributions per \$1,000 of Benefit</u>	<u>Projected Ratio of Contingency Reserve to Annual Benefit Payments in Following Year</u>				
	<u>1989</u>	<u>2000</u>	<u>2010</u>	<u>2025</u>	<u>2050</u>
\$0.20*	15.7	9.4	10.1	15.4	36.2

These projections indicate that the prospective contingency reserve could be reduced to more reasonable levels by a reduction of the rates per \$1,000 of insurance, an increase in amount of insurance provided by the current level of contributions, an increase in the amount of paid-up insurance provided on attainment of age 65 or a combination of these or other approaches.

The forecasts are based on the assumption that there will be substantial reductions in participant mortality in the future, reductions that appear to be reasonable but are not certain of being fully realized. For purposes of this report, assumptions with respect to future decreases in mortality of participants are the same as those used for purposes of the report on the Pension Plan for the Public Service of Canada (Part I of PSSA) as at December 31, 1989. They contain some margin of conservatism.

Even though we cannot be certain that future decreases in mortality will be in accordance with our assumptions, it is evident that the continuation of the current provisions for contributions and coverage will result in the contingency reserve increasing indefinitely to exorbitant levels. Consequently, consideration might well be given to reviewing the contribution rates and/or amounts of coverage.

* This rate is assumed to be paid by participants; in effect it means that employed participants would continue to pay \$0.40 per month for each \$1,000 of salary but would receive \$2,000 of insurance coverage in respect of that salary. In addition, government would credit to the Account one-twelfth of benefits paid subject to uniform contributions.

VI. Reconciliation of Projections of Cost and
Contingency Reserve in this Report with those
in the Previous Report

In the previous report the projections for the year 2050 showed the cost to be \$0.275 per \$1,000 of benefit and the ratio of contingency reserve to the following year's outlay to be 94.7. This report indicates that the corresponding figures are \$0.146 and 239.9. The principal reason for the difference in the projections for 2050 is the introduction in this valuation of assumptions with respect to decreases in future mortality rates.

The table below shows a reconciliation of the figures shown in the previous report with those shown in this report.

	<u>Monthly Cost per \$1,000 of Benefit in 2050*</u>	<u>Ratio of Contingency Reserve in 2050 to Following Year's Benefit Outlay</u>
Estimates in the report as at December 31, 1986	\$0.275	94.7
Effect of:		
a) methodology improvements	0	(9.0)
b) effect of intervaluation experience versus assumptions	0	2.3
c) changes in population composition	(.004)	2.4
d) changes in assumed new entrants	.011	(6.3)
e) changes in assumed salary increases and in assumed decrements other than mortality	(.007)	20.3
f) changes in assumed base-year mortality rates	(.033)	26.1
g) changes in mortality projection factors	(.096)	109.4
Estimates in the report as at December 31, 1989	\$0.146	239.9

* This cost is in respect of benefits (other than \$500 paid-up coverage) for employed and elective participants who are entitled to an immediate annuity on ceasing to be employed in the Public Service. Participants contribute at the rate of \$0.40 per month per \$1,000 of benefits coverage, regardless of age.

The following paragraphs describe the reasons for the effects illustrated in the above table.

Methodology improvements are the result of refining the application of methods and assumptions to the data.

The effect of intervaluation experience as compared to assumptions is the result of actual experience during the three year intervaluation period being slightly more favourable to the Account than the actuarial assumptions used in the valuation report as at December 31, 1986.

Changes in population composition reflect the difference between the population at December 31, 1986 projected to December 31, 1989 compared to the actual population at December 31, 1989.

Changes in assumed new entrants reflect the result of applying the revised new entrant assumption based on the new entrant experience from January 1, 1987 to December 31, 1989, compared to the assumption for the previous three-year period.

Changes in assumed salary increases and in assumed decrements other than mortality reflect more up-to-date experience.

Base-year mortality rates were changed to reflect the improvement in mortality for the period 1987-89 compared with the 1981-86 experience.

In the previous valuation, no mortality improvement factors were used for employed participants. In this valuation, such factors are used in respect of this group. Moreover, the factors previously used for elective participants were modified to reflect expected mortality reductions better.

VII. Data and Acknowledgments

The data required in respect of participants are maintained on computer file by the Superannuation Branch of Supply and Services Canada. The Pensions and Insurance Products Branch of that department is responsible for the computer programs that extract the valuation data. We examined the records that were supplied to us for consistency, interrelationships and general reasonableness and made such adjustments as we considered appropriate.

We wish to acknowledge the co-operation and able assistance of the Pensions and Insurance Products Branch of Supply and Services Canada during the course of this actuarial review.

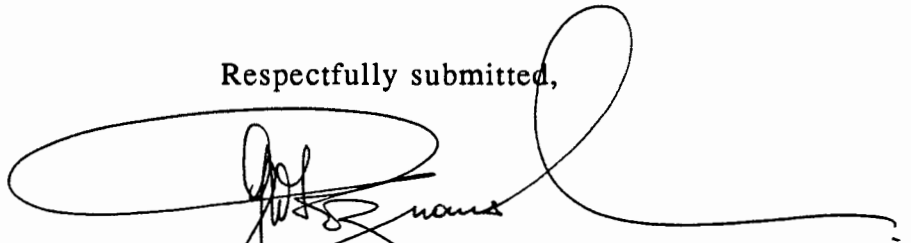
VIII. Actuarial Opinion

In my opinion, for the purpose of this actuarial report:

- (a) the data upon which the calculations have been based are sufficient and reliable;
- (b) the assumptions used are reasonable and appropriate for purposes of the actuarial calculations; and
- (c) the methods that have been employed are consistent with sound actuarial principles.

This report has been prepared and this opinion has been given in accordance with generally accepted actuarial principles and the Recommendations for Actuarial Advice Given with respect to Self-Insured Employee Benefit Plans of the Canadian Institute of Actuaries.

Respectfully submitted,

A large, stylized handwritten signature in black ink, appearing to read 'G.W. Poznanski', is written over the typed name. The signature is highly cursive and loops around the typed name.

G.W. Poznanski, F.S.A., F.C.I.A.
Chief Actuary

Ottawa, Canada
December 18, 1991

APPENDIX 1

Summary of the Supplementary Death Benefit Plan

The terms of the plan are set out in Part II of the Public Service Superannuation Act, entitled "Supplementary Death Benefits".

Participants

Employees and former employees of the Public Service who are eligible for benefits under Part II of the Act are termed "participants". They are divided into employed and elective participants.

(a) Employed Participants

For purposes of this report "employed participants" means all contributors to the Superannuation Account who are employed in the Public Service except (i) employees of Crown corporations who are excluded by regulation from Part II of the Act because they have group life insurance plans in operation and (ii) contributors who had elected not to come under the provisions of Part II of the Act at its inception in 1955.

(b) Elective Participants

The term "elective participants" means all participants who have ceased to be employed in the Public Service and have elected to continue as participants under Part II of the Act. The right of election is limited to participants who, at the time they cease to be employed in the Public Service, have at least five continuous years of service or have been participants under the plan for at least five continuous years. There are two categories of elective participants.

The first category comprises participants who become entitled to an immediate annuity under Part I of the Act upon cessation of employment. Although these are referred to as elective participants, since July 14, 1960 the only action such participants may take is to elect to reduce coverage to \$500.

The second category is made up of participants who do not become entitled to an immediate annuity under Part I of the Act upon cessation of employment. Election must be made either within one year before cessation of employment or within 30 days thereafter. The death benefit coverage is extended for 30 days after the date of cessation whether or not the participant exercises the right of election.

Benefits

The basic benefit is equal to the participant's annual rate of salary, if it is a multiple of \$250, and otherwise to the nearest multiple of \$250 above such salary, reduced by 10 per cent of such amount for every year of age in excess of age 60 attained by the participant. The annual rate of salary of an elective participant is defined as the annual rate of pay at the time of cessation of employment in the Public Service. The benefit payable on account of an employed participant at time of death cannot be less than the greater of \$500 and the multiple of \$250 equal to or next above one-sixth of the participant's annual rate of salary. The benefit payable to an elective participant entitled to an immediate annuity can never be less than \$500 which is the amount of reduced coverage that the participant may elect to retain. Such an election is irrevocable. The government provides to employed participants, and elective participants entitled to an immediate annuity, paid-up coverage of \$500 on attainment of age 65 or completion of five years of service, if later.

Contributions by Participants

For elective participants entitled to an immediate annuity on ceasing to be employed in the Public Service as well as for employed participants, the rate of contribution is \$0.10 per month for each \$250 of benefit coverage. At attainment of age 65 or completion of five years' service, if later, the total contribution is reduced by \$0.20 per month in recognition of the fact that \$500 of the benefit becomes paid-up for the remaining lifetime of the participant by means of a single premium credited to the Account by the government at that time.

For elective participants not entitled to an immediate annuity on ceasing to be employed in the Public Service, the rate of contribution is dependent upon the age of the participant on the thirtieth day immediately following the date on which the participant ceases to be employed. The following schedule shows the applicable rates for quinquennial ages:

<u>Age Last Birthday</u>	<u>Annual Contribution per \$1,000 of Benefit</u>	<u>Monthly Contribution per \$1,000 of Benefit</u>
25	\$ 9.70	\$0.82
30	11.42	0.97
35	13.58	1.15
40	16.29	1.39
45	19.72	1.67
50	24.11	2.05
55	29.80	2.53
60	37.65	3.20

Credits by Government

The government credits to the Public Service Death Benefit Account one-sixth of the benefits paid on which contributions were being paid (i) by participants who, at the time of death, were employed in the Public Service (other than by Crown corporations and public boards) and (ii) by elective participants entitled to an immediate annuity under Part I of the Act or an annual allowance payable immediately. In addition, the government credits to the Account, when each participant satisfies the requirements stated previously, an amount representing the single premium for \$500 of benefit coverage for life in respect of which no contributions are required from such participant, calculated on the basis of the Canadian Life Tables 1950-1952 and interest at 4 per cent per annum. The single premiums for this benefit are prescribed by Schedule II to the PSSA.

Crown corporations and public boards whose employees are participants contribute at the rate of \$0.02 per month for each \$250 of benefit coverage.

The Public Service Death Benefit Account is credited quarterly with interest calculated on the balance in the Account, in accordance with section 30 of the Supplementary Death Benefits Regulations. The rates specified in the regulations are the same as those at which interest credits in respect of the Public Service Superannuation Account are calculated. These rates, which vary from quarter to quarter, are based on hypothetical investments in long-term Government of Canada securities similar to those prescribed for purposes of the Canada Pension Plan. For the quarter ended December 31, 1989, the rate of interest was 2.6483 per cent which is equivalent to 11.02 per cent per annum.

APPENDIX 2

Description of Actuarial Methods and Assumptions

I. Actuarial Methods

A. Actuarial Method to Value Costs and Liabilities

The estimated monthly cost of insurance (or expected claims) for employed and elective participants who are entitled to an immediate annuity on ceasing to be employed in the Public Service is equal to the amount of insurance in force on these participants times the probability of death in that month.

The actuarial liability for the \$500 of paid-up benefit is the amount on December 31, 1989 which, together with interest at the assumed valuation interest rate, is estimated to be sufficient to pay the \$500 benefits on the deaths of eligible participants.

The actuarial liability for elective participants not entitled to an immediate annuity is the amount on December 31, 1989 which, together with contributions from these participants and interest at the assumed valuation interest rate, is estimated to be sufficient to pay the benefits at death.

B. Actuarial Method to Value Assets

The assets represent past contributions to the plan, net of benefit payments, accumulated with interest. They are shown at their "book" value; i.e., they are not adjusted to reflect changes in the interest environment.

II. Actuarial Assumptions

A. Interest

The Public Service Death Benefit Account is credited with interest at the same rate as the Public Service Superannuation Account.

For the purpose of projecting the Public Service Death Benefit Account for future years, we have used the same interest assumptions as in the Actuarial Report as at December 31, 1989 on the Pension Plan for the Public Service of Canada. These valuation interest assumptions are as follows:

Assumed Valuation Interest Rates

<u>Year</u>	<u>(%)</u>	<u>Year</u>	<u>(%)</u>	<u>Year</u>	<u>(%)</u>
1990	10.0	2000	8.7	2010	6.1
1991	10.0	2001	8.4	2011	5.9
1992	9.9	2002	8.0	2012	5.8
1993	9.9	2003	7.6	Ultimate	5.8
1994	9.8	2004	7.4		
1995	9.7	2005	7.1		
1996	9.5	2006	6.9		
1997	9.4	2007	6.7		
1998	9.2	2008	6.5		
1999	9.0	2009	6.3		

B. Mortality

(1) Employed Participants

The 1990 base-year mortality rates adopted for the purpose of this report (see Appendix 3A) are those used in the Actuarial Report as at December 31, 1989 on the Pension Plan for the Public Service of Canada. They are equal to 95 per cent of the rates experienced during the 1984-89 period by contributors employed in the Public Service with five or more years of pensionable service. For males, these mortality rates are generally lower than the mortality assumed for the purposes of the previous report on the Public Service Death Benefit Account.

Beginning with this valuation, the mortality assumption for employed participants takes into account the expected continued reductions in the rates of mortality at the various ages. This is consistent with the approach in the 1989 valuation of the Pension Plan for the Public Service of Canada where we assumed gradually reducing mortality rates, for active employees and retirees. Factors projecting the mortality reductions into the future are shown in Appendix 3D.

(2) Elective Participants Entitled to an Immediate Annuity

For mortality purposes, this class of elective participants was divided into two separate groups, depending on whether participants become entitled to an immediate annuity under Part I of the PSSA because of disability or other reasons.

For both types of annuitants, we decided to use the corresponding mortality assumptions in the Actuarial Report as at December 31, 1989 on the Pension Plan for the Public Service of Canada.

The mortality rates for 1990 are shown in Appendix 3B for elective participants entitled to an immediate annuity for reasons other than disability and in Appendix 3C for elective participants entitled to an immediate annuity because of disability. Mortality rates for later years are obtained by applying to the 1990 rates the projection factors reflecting future expected decreases in mortality. These factors are shown in Appendix 3D.

(3) Participants Entitled to the \$500 Paid-up Benefit Coverage (on Attaining Age 65)

The mortality rates used to value the paid-up benefit are those shown in Appendix 3B or 3C projected according to the factors in Appendix 3D. Rates in Appendix 3C were used for elective participants entitled to an immediate annuity because of disability and those in Appendix 3B were used for others.

(4) Elective Participants who do not become Entitled to an Immediate Annuity on Ceasing to be Employed in the Public Service

The mortality rates used to compute the actuarial liability are the same as those described in (2) above for elective participants entitled to an immediate annuity because of disability. The rates for 1990 are shown in Appendix 3C and the projection factors in Appendix 3D.

C. Other Assumptions

(1) Claims Incurred but not Reported

The reserve for claims incurred, but not reported, or reported but not paid, was assumed equal to two months claims paid in 1989.

(2) Projections of Costs

For purposes of projections, we assumed that:

- (a) the age distribution (by sex) of persons becoming participants in each future year will be the same as that observed in respect of persons who became contributors to the Superannuation Account during the period from January 1, 1987 to December 31, 1989;
- (b) the average salary (by age and sex) of persons becoming participants in each future year will be the same as that observed in respect of persons who became contributors to the Superannuation Account during the year January 1, 1989 to December 31, 1989, increased by the general (economic) salary increase factor;
- (c) the number of new entrants will be such as to result in a constant total employed participant population (by sex);
- (d) for participants employed in the Public Service the probabilities of remaining employed and retiring will be the same as the corresponding probabilities assumed for purposes of the Actuarial Report as at December 31, 1989 on the Pension Plan for the Public Service;

- (e) for employed participants the average amounts of benefit coverage will be the same as their coverage as at December 31, 1989, or at the date of entry, if later, increased by both the promotional salary scale and the general (economic) salary increase factor used for purposes of the Actuarial Report as at December 31, 1989 on the Pension Plan for the Public Service. Coverage after age 60 decreases by 10 per cent annually;
- (f) employed participants who cease to be employed without entitlement to an immediate annuity and become elective participants will not be a source of significant gain or loss; and
- (g) no elective participants entitled to an immediate annuity will elect to reduce their coverage to \$500 (in practice approximately 2 per cent elect to do so).

These assumptions are very broad but we believe that they produce reasonably safe estimates of the cost of benefit coverage in the long term.

APPENDIX 3A

Sample Rates of Mortality in 1990 for Employed Participants

<u>Age</u>	<u>Males</u>	<u>Females</u>
20	.0007	.0003
25	.0008	.0004
30	.0008	.0005
35	.0008	.0006
40	.0011	.0009
45	.0018	.0014
50	.0028	.0021
55	.0057	.0029
60	.0086	.0045
65	.0139	.0075
69*	.0218	.0116

* We have assumed that the highest age for an employed participant is 69 years.

APPENDIX 3B

Sample Rates of Mortality in 1990 for Elective Participants
Entitled to an Immediate Annuity for Reasons other than Disability

<u>Age</u>	<u>Males</u>	<u>Females</u>
50	.0042	.0018
55	.0066	.0027
60	.0099	.0046
65	.0168	.0076
70	.0297	.0133
75	.0481	.0259
80	.0798	.0463
85	.1238	.0754
90	.1792	.1204
95	.2523	.1966
100	.3440	.3181
105	.5061	.5258
109	1.0000	1.0000

APPENDIX 3C

Sample Rates of Mortality in 1990 for Elective Participants who are
in Receipt of an Immediate Annuity Because of Disability, or
Not Entitled to an Immediate Annuity

<u>Age</u>	<u>Males</u>	<u>Females</u>
25	.0061	.0076
30	.0092	.0081
35	.0123	.0087
40	.0152	.0095
45	.0182	.0106
50	.0211	.0120
55	.0237	.0141
60	.0283	.0173
65	.0380	.0223
70	.0551	.0305
75	.0736	.0441
80	.0977	.0682
85	.1366	.1153
90	.1867	.1938
95	.2693	.3170
100	.3939	.4943
105	.5432	.7145
109	1.0000	1.0000

APPENDIX 3D

Sample Mortality Projection Factors Assumed Applicable in 1991 and Later Years

<u>Age</u>	<u>Annual Reduction from Mortality Assumed to Exist in 1990</u> (as a Percentage)	
	<u>Males</u>	<u>Females</u>
25	0.10	0.50
30	0.50	0.75
35	0.75	1.25
40	1.00	1.75
45	1.50	1.75
50	1.50	1.50
55	1.30	1.50
60	1.30	1.50
65	1.30	1.50
70	1.25	1.50
75	1.25	1.45
80	1.20	1.45
85	0.90	1.05
90	0.55	0.70
95	0.10	0.30
100 +	--	--

APPENDIX 4A

Employed Participants as at December 31, 1989

<u>Age</u>	<u>Number</u>			<u>Coverage in thousands of dollars</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
to 24	2,761	4,686	7,447	\$ 76,613	\$ 121,204	\$ 197,817
25-29	12,953	16,619	29,572	413,482	486,414	899,896
30-34	25,006	24,385	49,391	885,027	776,877	1,661,904
35-39	34,684	25,082	59,766	1,343,338	842,498	2,185,836
40-44	34,764	20,492	55,256	1,482,903	700,210	2,183,113
45-49	25,047	12,969	38,016	1,117,708	433,586	1,551,294
50-54	19,927	9,285	29,212	877,290	297,462	1,174,752
55-59	14,723	6,436	21,159	624,908	200,248	825,156
60-64	7,329	3,164	10,493	275,431	85,678	361,109
65+	1,313	553	1,866	26,971	7,352	34,323
TOTAL	178,507	123,671	302,178	\$7,123,671	\$3,951,529	\$11,075,200

APPENDIX 4B

Elective Participants
Entitled to an Immediate Annuity because of Disability
as at December 31, 1989

<u>Age</u>	<u>Number</u>			<u>Coverage in thousands of dollars</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
to 24	0	0	0	\$ 0	\$ 0	\$ 0
25-29	0	2	2	0	41	41
30-34	18	26	44	449	631	1,080
35-39	56	91	147	1,523	2,111	3,634
40-44	129	102	231	3,403	2,307	5,710
45-49	249	153	402	6,731	3,498	10,229
50-54	530	277	807	15,564	6,221	21,785
55-59	1,144	522	1,666	31,663	11,535	43,198
60-64	1,428	559	1,987	29,048	9,281	38,329
65-69	1,642	555	2,197	9,994	2,798	12,792
70-74	1,085	420	1,505	694	235	929
75-79	396	244	640	198	122	320
80-84	74	77	151	37	39	76
85-89	13	10	23	7	5	12
90-94	4	4	8	2	2	4
95-99	0	0	0	0	0	0
100-104	0	0	0	0	0	0
105+	0	0	0	0	0	0
TOTAL	6,768	3,042	9,810	\$99,313	\$38,826	\$138,139

APPENDIX 4C

Elective Participants Entitled to
an Immediate Annuity for Reasons Other than Disability
as at December 31, 1989

<u>Age</u>	<u>Number</u>			<u>Coverage in thousands of dollars</u>		
	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
to 24	0	0	0	\$ 0	\$ 0	\$ 0
25-29	0	0	0	0	0	0
30-34	0	0	0	0	0	0
35-39	0	0	0	0	0	0
40-44	0	0	0	0	0	0
45-49	1	0	1	50	0	50
50-54	11	0	11	613	0	613
55-59	3,283	367	3,650	131,337	10,713	142,050
60-64	9,725	2,475	12,200	294,249	54,287	348,536
65-69	20,263	5,624	25,887	233,704	50,405	284,109
70-74	16,657	4,649	21,306	14,618	3,559	18,177
75-79	9,953	3,300	13,253	4,976	1,650	6,626
80-84	4,454	1,998	6,452	2,227	999	3,226
85-89	1,662	878	2,540	831	439	1,270
90-94	496	292	788	248	146	394
95-99	178	72	250	89	36	125
100-104	9	2	11	5	1	6
105+	0	0	0	0	0	0
TOTAL	66,692	19,657	86,349	\$682,947	\$122,235	\$805,182

APPENDIX 4D

Elective Participants
not Entitled to an Immediate Annuity
as at December 31, 1989

<u>Number</u>			<u>Coverage in thousands of dollars</u>		
<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
152	62	214	\$2,396	\$629	\$3,025