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5 December 1994

The Honourable Arthur C. Eggleton, P.C., M.P.
President of the Treasury Board
Ottawa, Canada
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Dear Minister:

Pursuant to section 59 of the *Public Service Superannuation Act*, I am pleased to transmit my report on the actuarial review, as at 31 December 1992, of the Public Service Death Benefit Account established under Part II of the *Public Service Superannuation Act*.

Yours sincerely,

Bernard Dussault
Chief Actuary

Canada

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I- Introduction

Part II (Supplementary Death Benefits) of the *Public Service Superannuation Act* (PSSA) provides for lump sum benefits in case of the death of members. The contributions made in respect of these benefits are credited to the Public Service Death Benefit Account, and benefits are charged against this Account.

This actuarial report has been prepared in accordance with section 59 of the PSSA which, pursuant to Bill C-55 enacted 29 September 1992, now encompasses Supplementary Death Benefits since 5 October 1992 for purposes of subsection 3(1) of the *Public Pensions Reporting Act* (PPRA). As required by section 6 of the PPRA, 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 cost of all future death benefits insured as at the valuation date.

The previous actuarial report was done as at 31 December 1989. During the period from 1 January 1990 to 31 December 1992, Bill C-55 brought important changes to the plan provisions by doubling the basic death benefit and by increasing the paid-up benefit from \$500 to \$5,000. The applicable contribution rate in respect of members was cut in half from \$0.10 to \$0.05 for every \$250 of basic insured benefit. The applicable Government contribution rate in respect of the basic insured benefits was also cut in half from one sixth to one-twelfth of the expected annual costs, while its contributions in respect of the paid-up insured benefits have remained unchanged.

The provisions of the plan deemed to apply for purposes of this report are described in Appendix 1 and take into account those that were effective as at the valuation date.

II- Data

A- Overview

As at 31 December 1992, the Supplementary Death Benefit plan included 408,909 members⁽¹⁾. Of this number, 307,465 were active members, 101,270 were inactive members entitled to an immediate annuity, and 174 were inactive members entitled to an annual allowance or a deferred annuity. The total amount of death benefits insured at that date was \$27,656.9 million.

B- Source

The valuation input data required in respect of members are maintained on electronic files by the Superannuation Branch of Public Works and Government Services Canada. The Pensions and Insurance Products Branch of that department administers the computer programs designed for the extraction of the valuation data.

The balance of the Account as at 31 December 1992, as well as the amount of contributions and interest due, was provided by the Superannuation Branch.

C- Validation

The records that were provided for purposes of this report were examined for their consistency, interrelationships and general reasonableness, and adjustments were made as deemed appropriate.

D- Acknowledgements

We acknowledge the co-operation and able assistance of the Pensions and Insurance Products Branch of Public Works and Government Services Canada during the course of this actuarial review.

E- Summaries

Summaries of data on members are provided in Appendix 3 of this report.

⁽¹⁾ See Appendix 1 for the definition of the various categories of members.

III- Methods

Due to their negligible effect on costs and liabilities, the 174 inactive members (see Table 3D in Appendix 3) entitled to an annual allowance or a deferred annuity were not taken into consideration for the purposes of this valuation.

A- Assets

Apart from contributions and interest due, the balance of the Public Service Death Benefit Account corresponds to the excess of past contributions to the plan over past benefit payments, all accrued with interest. Because the balance of the Account is not marketable, it is shown at its book value as opposed to market value.

B- Liabilities

- Due to the negligible effect of the 30-day extension of insurance upon termination of coverage and to the nature of term insurance paid for on a monthly basis, no liability is deemed to exist specifically in respect of the **insurance paid for on a term basis**.
- In respect of the individual \$5,000 **paid-up** portions of insured benefits, liabilities as at 31 December of a given year correspond to the amount which, together with interest at the assumed valuation rate, is sufficient to pay for each individual \$5,000 portion of insured benefit on the eventual death of all relevant members insured as at 31 December of that year.
- On the basis of the plan's experience, the reserve for **claims incurred but not reported, and reported but not paid**, is set equal to 1/6 of the average annual claims paid between 1 January 1987 and 31 December 1992.
- **The margins against adverse fluctuations**, held only in respect of the insurance paid-for on a term basis, correspond to the amount which, added to the current year's cost, provides a 99.5% statistical probability that the year's death benefits will not exceed the sum of the year's cost and these margins. It is deemed equal, assuming that the distribution of the number of deaths is binomial, to 2.6 times the standard deviation in the expected amount of deaths benefits. To this effect, the standard deviation is deemed equal to the square root of the expected number of deaths weighted by the square of the average amount of insurance.

C- Costs

The expected future annual costs of the plan are not constant and do accordingly differ from the applicable contributions rates (see item 3 of Appendix 1). These projected costs are used in this report mainly in the projection of the ratio of surplus to annual benefits payments.

- **Paid-up insurance**

The single premium for the individual \$5,000 paid-up portions of insured benefit corresponds to the initial (at the time the insurance becomes paid-up) value of the reserve computed as described in paragraph B above for the paid-up insured benefits.

- **Term insurance**

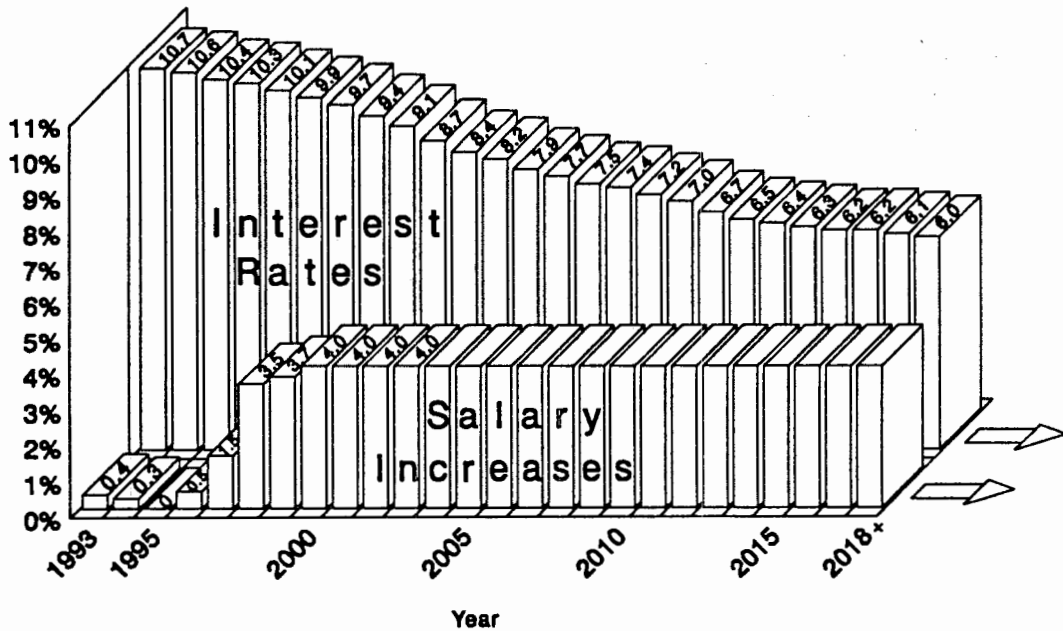
In respect of total insured death benefits in force paid for on a term basis, the estimated cost of insurance for a given month is equal to the corresponding amount of insured death benefits in force during that month multiplied by the mortality rate (probability of death) assumed to apply during that month.

IV- Assumptions

A- Economic Assumptions

For purposes of projecting the Public Service Death Benefit Account for future years, the economic assumptions, including the assumed seniority and promotional increases (shown in table 2A of Appendix 2), are those of the Actuarial Report as at 31 December 1992 on the Pension Plan for the Public Service of Canada. The relevant basic economic assumptions are summarized in the graphic below:

Basic Economic Assumptions



B- Demographic Assumptions

1. New Members

The projection of future members is required in the valuation process only for the computation of expected future annual costs of life insurance.

(a) Number

The number of new active members was determined to produce for each sex a stable total active member population.

(b) Age Distribution

The age distribution of new members in each future year is assumed to be, for each sex separately, the same as for new contributors to the Superannuation Account during the period from 1 January 1990 to 31 December 1992.

2. Termination Rates

For active members, the probabilities of terminating employment and of retiring are the same as the corresponding probabilities assumed for purposes of the Actuarial Report as at 31 December 1992 on the Pension Plan for the Public Service (see tables 2B to 2F of Appendix 2).

3. Amount of Insurance

(a) Active Members

The total amount of insured death benefits is deemed to be the one applicable as at 31 December 1992, or at the date of entry, if later, increased by both the average salary and the assumed seniority and promotional annual rate of increase. The prescribed reductions applying at ages 61 and over were also taken into account.

(b) Inactive Members Entitled to an Immediate Annuity

Experience data indicate that only approximately 2% of members elect to reduce to \$5,000 their amount of insured death benefit when they become entitled to an immediate annuity upon termination of employment before reaching age 65. No member was accordingly assumed to make such an election.

4. Mortality

Mortality rates are used for both the computation of death benefits and the survivorship of the insured members beyond the valuation date.

(a) Active Members

The mortality rates deemed to apply in 1993 (see table 2G of Appendix 2) are those used in the Actuarial Report as at 31 December 1992 on the Pension Plan for the Public Service of Canada. They are equal to 95% of the rates experienced on average during the 1984-1989 period by active contributors to the PSSA with five or more years of pensionable service updated for longevity improvement during 1990-1992 (using factors of table 2J in Appendix 2). These mortality rates are only marginally lower than the mortality assumed for the purposes of the previous report on the Public Service Death Benefit Account.

The mortality rates deemed to apply after 1993 are those assumed for 1993 and adjusted by the longevity improvement factors shown in table 2J of Appendix 2. The projection scale used is a modified version of Projection Scale H of the Society of Actuaries.

(b) Inactive Members Entitled to an Immediate Annuity and/or to the Paid-up Insured Benefit on Reaching Age 65

The mortality rates assumed for these inactive members were determined separately for retired and disabled pensioners as in the Actuarial Report as at 31 December 1992 on the Pension Plan for the Public Service of Canada.

The 1993 mortality rates are shown for retired pensioners in table 2H of Appendix 2 and for disabled pensioners in table 2I. Mortality rates for years after 1993 are obtained by applying to the 1993 mortality rates the longevity improvement factors shown in table 2J of Appendix 2.

V- Valuation Results

A- Balance Sheet

The following balance sheet was prepared using the experience data described in Section II, the valuation methods described in Section III and the assumptions described in Section IV.

Assets	(\$ millions)
Balance of Account	829.5
Contributions and interest due	90.0
Total assets as at 31 December 1992	919.6

Liabilities	(\$ millions)
Actuarial liability in respect of the \$5,000 paid-up insured death benefit for members at age 65 and over	170.3
Reserve for claims incurred but unreported, and reported but not paid	13.4
Margins against adverse fluctuations	5.5
Total liabilities as at 31 December 1992	189.2

Surplus	(\$ millions)
As at 31 December 1992	730.4

B- Costs and Contributions

The following costs were computed using the experience data described in Section II, the valuation methods described in Section III and the assumptions described in Section IV.

1. Recent experience

The total cost of all insured benefits actually paid during 1993 was \$96.0 million. Insured benefits include the term insurance (two times annual salary) and the paid-up insurance (individual \$5,000 portions).

• Paid-up Insurance

The amount of total related benefits paid in 1993 was \$18.4 million. Considering the actual total insured benefits of \$396.6 million during 1993, the total actual related benefit rate of payment was \$3.87 per month per \$1,000 of insured benefit in 1993. On the other hand, the estimated 1992 year-end single premium at age 65 per \$1,000 of insured benefit is \$301.03 and \$223.24 for males and females, respectively. The corresponding contribution rates (see item 3c of appendix 1) applicable for the paid-up insured benefits are \$62.00 and \$58.20.

• Term Insurance

The total related cost for 1993 was \$77.6 million. Considering the actual total insured benefits of \$26,785.7 million during 1993, the total actual cost rate was \$0.241 per month per \$1,000 of insured benefit in 1993.

Active and inactive members entitled to an immediate annuity are required by statute to contribute monthly \$0.20 per \$1,000 of insured benefit. On the other hand, the government contributes monthly an amount equal to one-twelfth of the actual total amount of death benefits payable during the month in respect of the death of active members and of inactive members entitled to an immediate annuity. For 1993, this government monthly contribution is estimated at \$0.020 per \$1,000 of insured benefit. Therefore, the total amount contributed by members and the government in respect of these members is \$0.220 per month per \$1,000 of insured benefit, as compared to the estimated monthly cost (paragraph above) of these benefits in 1993 of \$0.241 per \$1,000 of insured benefit.

From the annual report on the administration of the PSSA for each of the 12 fiscal years up to 31 March 1993, it may be derived that the actual average monthly cost rate varied between \$0.224 and \$0.294 per \$1,000 of insured benefit. These statistics also indicate that the actual costs have tended to decrease in recent years. The actual monthly benefit payments, averaged over six years, are shown below per \$1,000 of insured benefit:

<u>Six-year period Ending 31 March</u>	<u>Six-Year Average Monthly Benefit per \$1,000 of Insured Benefit</u>
1988	0.269
1989	0.260
1990	0.253
1991	0.248
1992	0.244
1993	0.239

2. Projected costs versus applicable contributions

- **Paid-up Insurance**

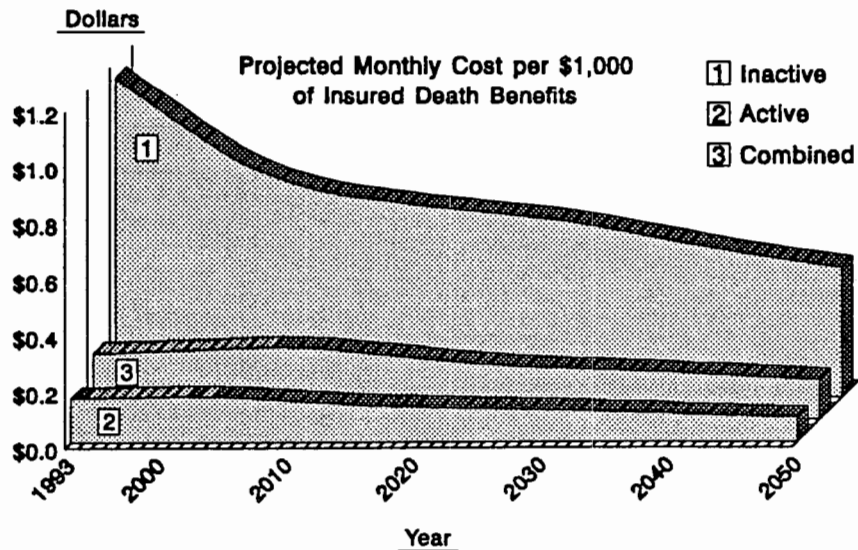
Consistent with assumed improvements in longevity, the single premium for the paid-up insurance would normally decrease over time. However, the assumed interest rate is lower at 6% ultimately than 10.5% for 1993. From 1992 year-end to 2050 year-end, the net effect of longevity improvements and decreasing interest rates, on the single premiums at age 65 per \$1,000 of insured benefit, is an increase from \$301.03 to \$328.09 for males, and from \$223.24 to \$251.96 for females. The corresponding contributions rates (see item 3c of appendix 1) applicable for the paid-up insured benefits are \$62.00 and \$58.20.

- **Term Insurance**

The monthly cost per \$1,000 of term insurance is expected to increase gradually to a level of approximately \$0.261 until 2008, and thereafter to decrease gradually to \$0.146 by 2050. The table and the graphic below illustrate the projected monthly cost per \$1,000 of insured death benefit for selected years from 1993 to 2050.

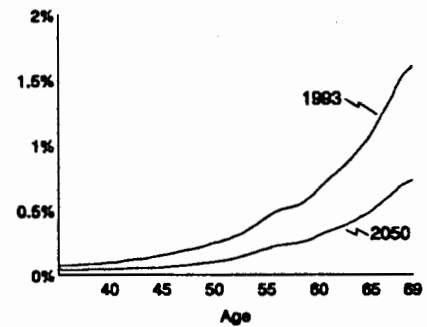
Projected Monthly Cost per \$1,000 of Insured Death Benefit

Category of members	1993	2005	2015	2030	2050
Active members	0.159	0.163	0.137	0.117	0.089
Inactive members entitled to an immediate annuity	1.145	0.798	0.701	0.619	0.467
Active and inactive members combined	0.241	0.260	0.240	0.185	0.146



The monthly cost expected for 2050 for the term insurance is 55.97% smaller than the monthly cost estimated for 1993. This is the result of three factors:

- There is a significant reduction in cost due to the assumed lower mortality for 2050 in accordance with the longevity improvements factors shown in table 2J of Appendix 2 applied to the current mortality rates shown in table 2G. The adjacent graphic shows the mortality rates (both sexes combined) deemed applicable for 1993 and the corresponding mortality rates assumed for 2050.



- A small reduction in cost results in connection with the expected change in the proportion of active members' insured benefits attributable to males, from 61.96% in 1993 to a level of 59.64% in 2050.
- The distribution of active members in the year 2050 is weighted more heavily at the older ages than currently. This has the effect of increasing costs. However, this increase is more than offset by the effect of the assumed lower mortality for 2050.

In respect of inactive members entitled to an immediate annuity, the monthly cost for 2050 is expected to decrease by approximately 59.21% from the monthly cost estimated for 1993. This reduction is mostly the result of the lower mortality assumed for 2050.

In aggregate, the 1993 cost in respect of active and inactive members entitled to an immediate annuity is expected to decrease by 39.45% by year 2050. The proportion of insured benefits for inactive members entitled to an immediate annuity, who carry a much higher cost, is expected to increase from 8.37% in 1993 to 15.11% in 2050.

C- Surplus (in respect of both the term and the paid-up insurance)

• **Recent experience**

The surplus (i.e., the difference between the assets and the liabilities) was \$730.4 million as at 31 December 1992. It corresponds to 7.6 times the total amount of death benefits estimated to be payable during 1993 while the total contributions in 1993 by and in respect of all members correspond to 75% of these benefits. By comparison, the surplus as at 31 December 1989 under the previous report was \$573 million. It corresponded to 15.7 times the amount of death benefits payable during 1990 while the total 1990 contributions corresponded to 180% of these benefits. These changes from the previous report are mainly due to the increases in insured benefits implemented without increase in contributions.

• **Long Term Outlook**

If interest accruals are not taken into account, the members' and government's contributions currently applicable (paragraph B1 above and item 3 of Appendix 1) are less than the estimated costs (paragraph B2 above) up to year 2028 in respect of the term insurance and at least until 2050 in respect of the paid-up insurance. However, accounting for the interest accruals on the Account results in a continuously increasing surplus, whether expressed in absolute dollar amounts or as a multiple of the expected annual benefits payments.

**Ratio of Projected Surplus
to Annual Benefit Payments in Following Year**

	1992	2000	2010	2025	2050
Without insured benefits increases	21.4	54.4	86.9	176.1	370.8
With insured benefits increases	7.6	12.9	16.8	29.5	62.9

V- Conclusions

A- Surplus

Despite the increase in the amount of insured death benefits recently implemented pursuant to Bill C-55 without any increase in total contributions, there is still a large surplus as at 31 December 1993 in the Public Service Death Benefit Account. Considering my opinion that

- the total liabilities make adequate provision for all benefits accrued as at 31 December 1992, and
- the members' and government's contribution rates presently applicable for 1993 and future years (even if they are lower than the costs estimated in this report), together with future interest earnings on the surplus as at 31 December 1992 and future net cash flows, will cause the surplus to continue to increase,

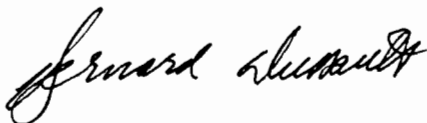
it would be appropriate to take measures now to reduce the surplus in the Public Service Death Benefit Account over time. The methodology for achieving this surplus reduction would require actuarial advice, the provision of which is not among the objectives of this statutory actuarial report.

B- Actuarial Standards

In my opinion, considering that this report was prepared pursuant to the *Public Pensions Reporting Act*,

- the valuation input data are sufficient and reliable;
- the assumptions used are in aggregate reasonable and appropriate;
- the methods employed are appropriate.

This report has been prepared, and my opinion given, in accordance with accepted actuarial practice, and particularly with the Recommendations of the Canadian Institute of Actuaries for actuarial advice given with respect to self-insured employee benefit plans.



Bernard Dussault, B.Sc., F.S.A., F.C.I.A.
Chief Actuary

Ottawa, Canada
5 December 1994

APPENDIX 1**Summary of Plan Provisions,
in force as at 31 December 1992,
of the Supplementary Death Benefit Plan**

Following is a summary description of the main provisions of the Supplementary Death Benefit (SDB) plan. The exact terms of this plan are set out in Part II (Supplementary Death Benefits) of the *Public Service Superannuation Act (PSSA)*.

1. Membership**(a) Active Members**

Active members means all contributors to the Superannuation Account who are employed in the Public Service except

- employees of Crown corporations who are excluded by regulation from Part II of the PSSA (they are covered under distinct group life insurance plans), and
- contributors who had elected not to join the SDB plan when it was implemented in 1955.

(b) Inactive Members

Inactive members means all members who have ceased to be employed in the Public Service and are still covered under the SDB plan. Such right is limited to members who, at the time they cease to be employed in the Public Service, have at least five years of continuous service in the Public Service or membership in the SDB plan.

Members entitled to an annual allowance or a deferred annuity under the PSSA upon cessation of employment may elect to continue their full coverage under the SDB plan, otherwise their membership is discontinued. This election must be made within the 13-month period running from one year before, to the 30th day following, cessation of employment. The insured death benefit is extended for 30 days after the date of cessation whether or not the member exercises the right of election.

2. Amount of Insured Death Benefit

Subject to the applicable reductions described below, the insured benefit payable in case of death of a member is equal to two times the member's annual rate of salary, if it is a multiple of \$250, and otherwise to the next higher multiple of \$250. The annual rate of salary of an inactive member is defined as the annual rate of pay at the time of cessation of employment in the Public Service.

Members entitled to an immediate annuity under the PSSA upon cessation of employment may then elect to reduce their amount of insured death benefit to \$5,000 (\$500 before the enactment of Bill C-55).

The amount of insurance described in the first paragraph above is reduced by 10% a year starting at age 61 until it would normally totally vanish at age 70. However, the amount of insurance cannot be reduced below a basic floor value of \$5,000 subject to the following two exceptions:

- for those inactive members who had, upon cessation of employment prior to the enactment of Bill C-55, made an election to reduce their insured death benefit to \$500 and further had made a second election to keep their insured death benefit at \$500 within one year following the introduction of Bill C-55, the floor value is \$500 instead of \$5,000. Such elections are irrevocable;
- for active members, the amount of insurance cannot be reduced below the multiple, even if higher than \$5,000, of \$250 equal to or next above one third of the member's annual rate of salary.

3. Contributions

(a) Active Members, and inactive members entitled to an immediate annuity

For active members, and for inactive members entitled to an immediate annuity on ceasing to be employed in the Public Service, the rate of contribution is \$0.05 per month for each \$250 of insured benefit. At attainment of age 65 (or completion of five years of service, if later), the total contribution is reduced by \$1.00 per month in recognition of the fact that a \$5,000 portion of the insured death benefit becomes paid-up for the remaining lifetime of the member.

(b) **Inactive members entitled to an annual allowance or a deferred annuity**

For inactive members entitled, on ceasing to be employed in the Public Service, to an annual allowance or a deferred annuity, the applicable contribution rate varies in accordance with the attained age of the member, and the corresponding contributions start being chargeable on the 30th day immediately following the date on which the member ceases to be employed. The adjacent table shows the applicable rates for quinary ages:

Age last birthday	Contribution per \$1,000 of insured benefit	
	Annual	Monthly
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

(c) **Government**

• **Term insurance**

The government credits monthly to the Public Service Death Benefit Account an amount equal to one-twelfth of the total amount of death benefits actually payable (excluding the individual \$5,000 paid-up portions of insured benefits), at the time of their death during that month, in respect of active members and inactive members entitled to an immediate annuity. Crown corporations and public boards whose employees are members contribute at the rate of \$0.01 per month for each \$250 of insured benefit.

• **Paid-up insurance**

In addition, the government credits to the Account, when a member reaches age 65 (or completion of five years of service, if later), the single premium for the individual \$5,000 paid-up portion of insured benefit in respect of which contributions are no longer required from the member.

This single premium rate for each 1\$ of paid-up insured benefit is computed on the basis of the Canadian Life Tables 1950-1952 and interest at 4% per annum. The amount of single premium for each individual \$5,000 paid-up portion of insured benefit, which is prescribed through Schedule II to the PSSA, corresponds to 1/10 of the single premium rate described above and is shown in the adjacent table:

Age nearest birthday	Single Premium (\$)	
	Males	Females
65	310	291
66	316	298
67	323	306
68	329	313
69	336	320
70	343	328
71	349	335
72	356	342
73	362	349
74	369	356
75	375	363

4. Interest

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 used in respect of the Public Service Superannuation Account. These rates, which vary from quarter to quarter, are deemed to apply to notional investments in long-term Government of Canada securities and correspond to those prescribed for purposes of the Canada Pension Plan. For the quarter ended 31 December 1992, the rate of interest was 2.611% which is equivalent to an effective annual rate of 10.86%.

APPENDIX 2

Sample Demographic Assumptions

Table 2A
Assumed seniority and promotional salary increases

<u>Service⁽²⁾</u> (number of years)	<u>Males</u> (%)	<u>Females</u> (%)
0	4.75	5.60
1	4.05	4.80
2	3.40	4.05
3	2.85	3.35
4	2.35	2.75
5	1.95	2.30
6	1.70	1.95
7	1.50	1.70
8	1.35	1.55
9	1.25	1.45
10	1.15	1.35
11	1.05	1.25
12	1.00	1.20
13	0.95	1.15
14	0.90	1.10
15	0.85	1.05
16	0.80	1.00
17	0.80	0.95
18	0.75	0.90
19	0.70	0.85
20	0.70	0.80
21	0.70	0.80
22	0.65	0.75
23	0.60	0.70
24	0.60	0.70
25	0.60	0.70
26	0.60	0.70
27	0.60	0.65
28	0.60	0.60
29	0.60	0.60
30	0.60	0.60
31	0.65	0.60
32	0.70	0.60
33	0.70	0.60
34	0.75	0.65
35	0.80	0.70
36	0.80	0.70
37	0.85	0.70
38-44	0.90	0.70

⁽²⁾ Expressed in completed years calculated as at the beginning of the calendar year.

Table 2B

Assumed rates of non-vested termination

<u>Service⁽³⁾</u>	<u>Males</u> (%)	<u>Females</u> (%)
0	20.0	25.0
1	10.5	12.5
2	8.0	9.0
3	6.5	7.2

Table 2C

Assumed rates of vested termination (for reasons other than death or disability) prior to age 50 or prior to age 60 with less than 25 years of pensionable service

<u>Service⁽³⁾</u>	<u>Males</u> (%)	<u>Females</u> (%)
4	5.5	6.2
5	4.6	5.5
6	4.0	4.9
7	3.5	4.4
8	3.1	4.0
9	2.7	3.6
10	2.3	3.3
11	2.0	3.0
12+	1.4	2.5

⁽³⁾ Expressed in completed years calculated as at the beginning of the calendar year.

Table 2D

Assumed proportions electing a deferred annuity or an annual allowance⁽⁴⁾

<u>Age Last Birthday</u>	<u>Males Proportion</u>	<u>Females Proportion</u>
21	0.000	0.001
22	0.000	0.001
23	0.001	0.002
24	0.002	0.003
25	0.004	0.005
26	0.006	0.007
27	0.008	0.009
28	0.011	0.011
29	0.013	0.014
30	0.017	0.016
31	0.020	0.020
32	0.025	0.024
33	0.029	0.028
34	0.034	0.032
35	0.040	0.036
36	0.048	0.043
37	0.058	0.050
38	0.069	0.059
39	0.080	0.067
40	0.090	0.073
41	0.097	0.078
42	0.103	0.082
43	0.108	0.086
44	0.112	0.091
45	0.121	0.098
46	0.137	0.112
47	0.162	0.136
48	0.196	0.171
49	0.243	0.216
50	0.327	0.268
51	0.408	0.325
52	0.489	0.387
53	0.567	0.455
54	0.642	0.526
55	0.713	0.600
56	0.783	0.676
57	0.847	0.752
58	0.908	0.828

⁽⁴⁾ These benefit option rates apply to terminated vested members (for reasons other than death or disability) who have not attained age 60 or age 50 with 25 years of pensionable service. The rate is 100% for benefits earned from October 1967 by members who have reached age 45 and have 10 or more years of pensionable service.

Table 2E

Assumed rates of vested termination for reasons other than disability and death from age 60, or from age 50 with 25 or more years of pensionable service

Age Last Birthday	MALES Number of Years of Pensionable Service ⁽⁵⁾												
	4-9	10-14	15-19	20-23	24	25-28	29	30	31	32	33	34	35+
49	0.000	0.000	0.000	0.000	0.015	0.015	0.020	0.025	0.025	0.030	0.040	0.060	0.060
50	0.000	0.000	0.000	0.000	0.020	0.020	0.025	0.030	0.030	0.035	0.045	0.065	0.065
51	0.000	0.000	0.000	0.000	0.020	0.025	0.030	0.040	0.040	0.045	0.055	0.075	0.075
52	0.000	0.000	0.000	0.000	0.025	0.030	0.035	0.045	0.050	0.060	0.065	0.095	0.095
53	0.000	0.000	0.000	0.000	0.035	0.040	0.045	0.060	0.070	0.080	0.090	0.150	0.150
54	0.000	0.000	0.000	0.000	0.045	0.050	0.270	0.270	0.270	0.270	0.270	0.550	0.500
55	0.000	0.000	0.000	0.000	0.045	0.050	0.250	0.250	0.210	0.210	0.210	0.460	0.360
56	0.000	0.000	0.000	0.000	0.050	0.055	0.250	0.250	0.210	0.210	0.210	0.460	0.360
57	0.000	0.000	0.000	0.000	0.060	0.060	0.250	0.250	0.210	0.210	0.210	0.460	0.360
58	0.000	0.000	0.000	0.000	0.060	0.065	0.250	0.250	0.210	0.210	0.210	0.460	0.360
59	0.170	0.170	0.170	0.210	0.270	0.280	0.390	0.390	0.370	0.320	0.320	0.600	0.450
60	0.180	0.180	0.180	0.220	0.230	0.280	0.350	0.350	0.330	0.320	0.320	0.550	0.400
61	0.180	0.180	0.180	0.220	0.230	0.280	0.315	0.315	0.315	0.315	0.315	0.500	0.410
62	0.200	0.200	0.200	0.235	0.250	0.285	0.325	0.325	0.325	0.325	0.325	0.500	0.410
63	0.250	0.250	0.250	0.275	0.275	0.305	0.350	0.350	0.350	0.350	0.350	0.600	0.480
64	0.690	0.690	0.690	0.760	0.760	0.790	0.800	0.760	0.710	0.710	0.710	0.830	0.730
65	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480
66	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480
67	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480
68	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480
69	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480

Age Last Birthday	FEMALES Number of Years of Pensionable Service ⁽⁵⁾												
	4-9	10-14	15-19	20-23	24	25-28	29	30	31	32	33	34	35+
49	0.000	0.000	0.000	0.000	0.035	0.035	0.040	0.040	0.045	0.045	0.050	0.070	0.070
50	0.000	0.000	0.000	0.000	0.035	0.035	0.045	0.045	0.050	0.055	0.065	0.090	0.090
51	0.000	0.000	0.000	0.000	0.040	0.040	0.050	0.060	0.060	0.060	0.070	0.095	0.095
52	0.000	0.000	0.000	0.000	0.040	0.045	0.055	0.065	0.065	0.070	0.070	0.100	0.100
53	0.000	0.000	0.000	0.000	0.055	0.060	0.070	0.085	0.090	0.090	0.090	0.140	0.140
54	0.000	0.000	0.000	0.000	0.090	0.095	0.260	0.260	0.260	0.260	0.260	0.520	0.480
55	0.000	0.000	0.000	0.000	0.090	0.095	0.240	0.240	0.210	0.190	0.190	0.400	0.270
56	0.000	0.000	0.000	0.000	0.090	0.095	0.240	0.240	0.210	0.190	0.190	0.400	0.270
57	0.000	0.000	0.000	0.000	0.090	0.095	0.240	0.240	0.210	0.190	0.190	0.400	0.270
58	0.000	0.000	0.000	0.000	0.090	0.095	0.240	0.240	0.210	0.190	0.190	0.400	0.270
59	0.120	0.170	0.220	0.250	0.280	0.310	0.380	0.380	0.360	0.310	0.300	0.640	0.330
60	0.130	0.190	0.220	0.270	0.270	0.310	0.330	0.320	0.310	0.310	0.300	0.520	0.330
61	0.120	0.170	0.210	0.250	0.250	0.280	0.310	0.300	0.300	0.300	0.300	0.500	0.330
62	0.150	0.200	0.230	0.270	0.270	0.300	0.310	0.300	0.300	0.300	0.300	0.500	0.310
63	0.190	0.260	0.280	0.340	0.340	0.370	0.390	0.340	0.320	0.350	0.350	0.550	0.400
64	0.650	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.770	0.770	0.800	0.700
65	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480
66	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480
67	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480
68	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480
69	0.400	0.400	0.400	0.420	0.420	0.420	0.480	0.480	0.480	0.480	0.480	0.480	0.480

⁽⁵⁾ Expressed in completed years calculated as at the beginning of the calendar year.

Table 2F

Assumed rates of termination due to disability

<u>Age Last Birthday</u>	<u>Males</u>	<u>Females</u>
21	0.0002	0.0000
22	0.0002	0.0000
23	0.0002	0.0001
24	0.0002	0.0002
25	0.0002	0.0002
26	0.0002	0.0003
27	0.0002	0.0003
28	0.0002	0.0004
29	0.0002	0.0004
30	0.0003	0.0004
31	0.0003	0.0005
32	0.0003	0.0005
33	0.0003	0.0005
34	0.0004	0.0006
35	0.0004	0.0006
36	0.0005	0.0007
37	0.0005	0.0008
38	0.0006	0.0009
39	0.0008	0.0010
40	0.0009	0.0012
41	0.0011	0.0014
42	0.0013	0.0016
43	0.0015	0.0019
44	0.0018	0.0023
45	0.0022	0.0028
46	0.0026	0.0033
47	0.0032	0.0039
48	0.0039	0.0047
49	0.0047	0.0055
50	0.0056	0.0064
51	0.0066	0.0074
52	0.0077	0.0084
53	0.0088	0.0094
54	0.0100	0.0104
55	0.0113	0.0114
56	0.0125	0.0123
57	0.0138	0.0132
58	0.0151	0.0140
59	0.0000	0.0000

Table 2G**Sample of mortality rates assumed for 1993 in respect of active members**

<u>Age</u>	<u>Males</u>	<u>Females</u>
25	.0008	.0004
30	.0008	.0005
35	.0009	.0006
40	.0011	.0009
45	.0018	.0013
50	.0029	.0021
55	.0060	.0030
60	.0088	.0046
65	.0142	.0075
69 ⁽⁶⁾	.0210	.0111

⁽⁶⁾ It was assumed that the highest age for an active member is 69 years.

Table 2H**Mortality rates assumed for 1993 in respect of retirement pensioners**

<u>Age</u>	<u>Males</u>	<u>Females</u>
50	.0042	.0019
55	.0066	.0029
60	.0100	.0048
65	.0172	.0080
69	.0271	.0126
75	.0487	.0276
80	.0808	.0488
85	.1254	.0789
90	.1827	.1265
95	.2592	.2070
100	.3558	.3343
105	.6317	.6145
109	1.0000	1.0000

Table 2I

Mortality rates assumed for 1993 in respect of disabled pensioners

<u>Age</u>	<u>Males</u>	<u>Females</u>
25	.0064	.0075
35	.0095	.0080
35	.0126	.0084
40	.0155	.0091
45	.0185	.0101
50	.0214	.0117
55	.0241	.0138
60	.0291	.0169
65	.0395	.0220
69	.0532	.0282
75	.0756	.0440
80	.1009	.0687
85	.1413	.1179
90	.2124	.1841
95	.3193	.2873
100	.4801	.4486
105	.7217	.7002
109	1.0000	1.0000

Table 2J

Annual longevity improvement factors assumed for 1994 and later years

<u>Age</u>	<u>Assumed constant annual reduction in 1993 mortality</u>	
	<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 3

Summaries of Data

Table 3A
Active members as at 31 December 1992

<u>Age</u>	<u>Number</u>			<u>Insured Benefits in thousands of dollars</u>		
	<u>Males</u>	<u>Females</u>	<u>Total</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
to 24	2,228	3,644	5,872	143,706	212,818	356,524
25-29	11,622	14,254	25,876	835,664	942,410	1,778,074
30-34	21,525	22,885	44,410	1,696,845	1,624,764	3,321,609
35-39	31,246	27,316	58,562	2,612,028	2,025,423	4,637,451
40-44	36,047	24,988	61,035	3,274,210	1,920,035	5,194,245
45-49	31,044	17,796	48,840	3,023,631	1,357,630	4,381,261
50-54	21,773	11,080	32,853	2,164,006	815,769	2,979,775
55-59	12,989	6,528	19,517	1,262,545	456,206	1,718,751
60-64	6,028	2,881	8,909	491,494	173,698	665,192
65-69	<u>1,094</u>	<u>497</u>	<u>1,591</u>	<u>41,315</u>	<u>12,263</u>	<u>53,578</u>
Total	175,596	131,869	307,465	15,545,443	9,541,017	25,086,460

Table 3B

**Inactive members
entitled to an immediate annuity because of disability
as at 31 December 1992**

<u>Age</u>	<u>Number</u>			<u>Insured Benefits in thousands of dollars</u>		
	<u>Males</u>	<u>Females</u>	<u>Total</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
to 24	0	0	0	0	0	0
25-29	1	1	2	48	55	103
30-34	14	18	32	788	1,043	1,831
35-39	52	90	142	3,390	5,782	9,172
40-44	164	183	347	11,093	11,312	22,406
45-49	336	212	548	24,492	13,398	37,890
50-54	595	339	934	45,709	21,133	66,843
55-59	1,058	587	1,645	83,620	34,573	118,193
60-64	1,373	657	2,030	76,429	31,254	107,683
65-69	1,310	528	1,838	20,720	6,990	27,710
70-74	1,294	480	1,774	6,465	2,400	8,865
75-79	557	317	874	2,785	1,585	4,370
80-84	140	120	260	700	595	1,295
85-89	28	32	60	140	160	300
90-94	2	3	5	10	15	25
95-99	0	0	0	0	0	0
100-104	0	0	0	0	0	0
105-109	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	6,924	3,567	10,491	276,391	130,295	406,686

Table 3C

**Inactive members entitled to
an immediate annuity for reasons other than disability
as at 31 December 1992**

<u>Age</u>	<u>Number</u>			<u>Insured Benefits in thousands of dollars</u>		
	<u>Males</u>	<u>Females</u>	<u>Total</u>	<u>Males</u>	<u>Females</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	132	0	132
50-54	9	0	9	1,187	0	1,187
55-59	3,155	433	3,588	333,455	32,618	366,073
60-64	9,947	2,410	12,357	803,960	132,059	936,018
65-69	16,629	5,435	22,064	474,384	116,936	591,320
70-74	19,145	5,338	24,483	95,725	26,690	122,415
75-79	11,935	3,864	15,799	59,670	19,320	78,990
80-84	5,660	2,360	8,020	28,290	11,790	40,080
85-89	2,120	1,119	3,239	10,600	5,595	16,195
90-94	530	344	874	2,650	1,720	4,370
95-99	182	125	307	910	625	1,535
100-104	24	14	38	120	70	190
105-109	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	69,337	21,442	90,779	1,811,083	347,422	2,158,500

Table 3D

**Inactive members
entitled to an annual allowance or a deferred annuity
as at 31 December 1992**

<u>Males</u>	<u>Number</u>		<u>Insured benefits in thousands of dollars</u>		
	<u>Females</u>	<u>Total</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
123	51	174	4,303	993	5,296

APPENDIX 4
Reconciliation of the Cost and the Surplus

	Monthly Cost projected for 2050 per \$1,000 of Insured Death Benefit (excluding the paid-up insurance)	Ratio of Surplus in 2050 to following Year's Benefit Payments (including the paid-up insurance)
Previous report as at 31 December 1989	\$0.146	239.9
a) Changes in basic economic assumptions	0.005	114.5
b) Changes in assumed decrements other than mortality	(0.004)	11.0
c) Intervaluation economic experience (interest and salaries) versus assumptions	(0.001)	10.1
d) Methodology improvements and correction of errors	(0.002)	5.3
e) Changes in the composition of the starting population	(0.002)	(2.4)
f) Changes to age/service from <i>nearest to last</i> basis	0.003	(3.3)
g) Changes in assumed base-year (1993) mortality rates	0.002	(4.3)
h) Increases in insured benefits	(0.001)	(307.9)
This report as at 31 December 1992	0.146	62.9

Reconciliation
Ratio of Surplus in 2050 to Following Year's Benefit Outlay

