

Actuarial Report

on the

REGULAR FORCE DEATH BENEFIT ACCOUNT

as at 31 March 2000



Office of the Superintendent
of Financial Institutions

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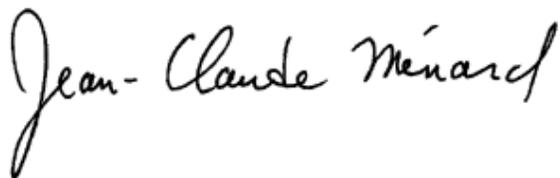
18 January 2002

The Honourable Lucienne Robillard, P.C., M.P.
President of the Treasury Board
Ottawa, Canada
K1A 0R5

Dear Minister:

Pursuant to section 71 of the *Canadian Forces Superannuation Act*, I am pleased to submit the report on the actuarial review as at 31 March 2000 of the Regular Force Death Benefit Account established under Part II of this Act.

Yours sincerely,

A handwritten signature in black ink that reads "Jean-Claude Ménard". The signature is written in a cursive, flowing style.

Jean-Claude Ménard, F.S.A., F.C.I.A.
Chief Actuary
Public Sector Insurance and Pension Programs

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I- Executive Summary

A- Purpose of this Actuarial Report

This actuarial report on the supplementary death benefit plan established under Part II of the *Canadian Forces Superannuation Act* (CFSA) was made as at 31 March 2000 (see section B below) pursuant to section 71 of the CFSA, which states that for valuation purposes the plan shall be treated as if it were a pension plan subject to the *Public Pensions Reporting Act* (PPRA). The previous review was made as at 31 March 1997. The scheduled date of the next periodic review pursuant to section 71 is 31 March 2003.

In accordance with accepted actuarial practice and with the PPRA to which section 71 refers, the main purpose of this actuarial report is to show realistic long-term projections of the assets, liabilities and financial position of the plan to assess the adequacy of the legislated contribution rates.

B- Adjusted Valuation Date

This valuation report rests on the premise that the latest certified Regular Forces Death Benefit (RFDB) Account balance is the appropriate starting point for the long-term projection of assets, liabilities and surplus or deficit. The balance for the plan year¹ ended 31 March 2001 is available from the 2000-01 Accounts of Canada. We could have used the balance sheet for the plan year ended 31 March 2000 but we opted to use the most recent available information.

C- Scope of the Report

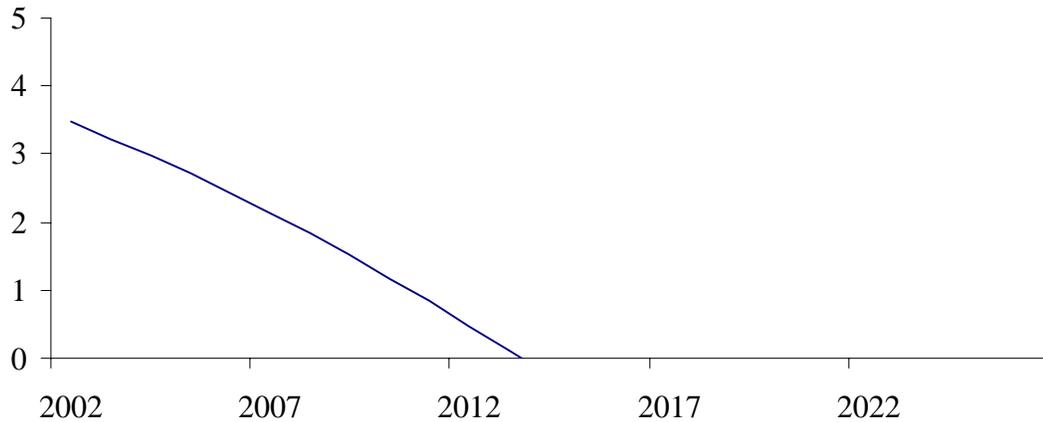
There were no modifications to the plan provisions since the previous report's date. This valuation report is based on the plan provisions shown in Appendix 2.

D- Main Findings

- As at 31 March 2001, the plan had an actuarial surplus of \$114 million resulting from the difference between the assets of \$186 million and the liabilities of \$72 million.
- The current actuarial surplus of \$114 million in the Regular Force Death Benefit Account is projected to gradually vanish and become a deficit during plan year 2014 because projected benefits exceed for each plan year the sum of legislated contributions and projected investment earnings.
- For the same reason, the current assets of \$186 million in the Regular Force Death Benefit Account are projected to become exhausted during plan year 2019.

¹ Any reference to a given *plan year* in this report should be taken as the 12-month period ending 31 March of the given year.

Figure 1
Ratio of Projected Actuarial Surplus at the End of the Plan Year to Annual
Benefit Payments Projected for the Following Plan Year



The ratio of the projected actuarial surplus at the end of the plan year to the annual benefit payments projected for the following plan year shown in figure 1, is expected to decrease to zero by plan year 2014 due to the excess of the projected death benefits over the combined projected contributions and investment earnings for all future plan years.

II- Financial Position of the Plan

A- Balance Sheet as at 31 March 2001

The following balance sheet was prepared using the assets described in Appendix 3, the data described in Appendix 4, the methodology described in Appendix 5, and the assumptions described in Appendices 6 and 7

Table A
Balance Sheet

(in millions of dollars)

Assets	186.2
Liabilities	
For paid-up life insurance on participants ages 65 and over	67.2
For incurred but unreported or pending claims	<u>4.9</u>
Total liabilities	72.2
Actuarial Surplus	114.0

B- Financial Position

At 31 March 2001 the actuarial surplus totalled \$114 million, being 3.7 times the total amount of death benefits projected for plan year 2002. By comparison, the actuarial surplus as at 31 March 1997 under the previous report was \$114 million, which was 3.7 times the amount of death benefits paid during plan year 1998.

As shown in Appendix 3 and explained in section 4 below, the projected contributions to the plan are less than the projected benefits for all future plan years. This projected annual shortfall is greater than the projected annual investment earnings on the Account and accordingly entails a continuously decreasing actuarial surplus. The actuarial surplus is therefore projected to become an actuarial deficit during plan year 2014, while the Account is projected to become exhausted in plan year 2019.

In the two previous Actuarial Reports on the Regular Force Death Benefit Account, we overestimated the total expected death benefit payments to be paid in future years with the consequence that the Account was expected to become exhausted at an earlier date than what is now forecasted. The inaccurate Account projection was mainly the result of an overstated mortality assumption for ages below 60. In light of this, a new mortality assumption was developed for non-elective and elective retirement participants in the Regular Force Death Benefit Plan. This assumption differs slightly from the corresponding assumption used in the Canadian Forces Superannuation Plan as reported in the Actuarial Report as at 31 March 2000 on the Pension Plan of the Canadian Forces.

However, even after adjusting the mortality assumption, projected benefits during April 1999 to March 2001 were still 13% higher than those shown in the Regular Force Death Benefit Account for the same period¹.

C- Sensitivity of Valuation Results to Variations in Key Assumptions

The following supplementary estimates indicate the degree to which the valuation results depend on some of the key assumptions. These resulting differences can also serve as a basis for approximating the effect of other numerical variations in a key assumption, to the extent that such effects are indeed linear.

1. Projected Investment Yields

As a measure of sensitivity, an increment of one percentage point in the projected yields would change from 2019 to 2021 the plan year during which the Account is projected to become exhausted as well as change from 2014 to 2016 the plan year during which the actuarial surplus is projected to become exhausted.

On the opposite side, a decrease of one percentage point in the projected yields would change from 2019 to 2017 the plan year during which the Account is projected to become exhausted as well as change from 2014 to 2012 the plan year during which the actuarial surplus is projected to become exhausted.

2. Mortality

If the assumed improvements in longevity after the 2002 plan year were disregarded, then the monthly benefit cost rate² of 19.7 cents projected for 2025 would climb to 26.7 cents, an increase of 36%. The Account is projected to become exhausted by plan year 2015 instead of 2019.

However, if the assumed improvements in longevity after the 2002 plan year were kept at the level of plan year 2002, resulting in greater improvements in longevity than those assumed in table 6H, then the monthly benefit cost rate of 19.7 cents projected for 2025 would decline to 16.8 cents, a decrease of 15%. This would change from 2019 to 2020 the plan year during which the Account is projected to become exhausted.

¹ We also found a discrepancy between the data supplied by the Department of National Defence and data supplied by the Department of Public Works and Government Services. For the elective population the membership status of about 5,000 records differed. However, the net effect on the valuation, as shown in section III, is negligible.

² The expression 'monthly benefit cost rate' is defined as the ratio of the total expected monthly death benefit payments over the total amount of expected monthly coverage, where coverage is expressed per thousand dollars.

III- Reconciliation of Results with Previous Report

Table B indicates that the change in longevity improvement factors is the main reason for the increase in the projected monthly benefit cost rate from 19.1 cents shown in the previous report to that of 19.7 cents of this report but this increase has been nullified by changes in assumed mortality rates and other demographic assumptions.

Table B
Reconciliation of Results

<u>Projections for Plan Year 2025</u>	Monthly Cost per \$1,000 of Term Insurance (Cents)
As at 31 March 1997	19.1
Change in program and correction of errors	0.0
Intervaluation economic experience and change in population	0.2
Change in economic assumptions	0.3
Change in assumed mortality rates for plan year 2001	(1.2)
Change in longevity improvement factors	2.2
Change in demographic assumptions other than mortality rate	(1.0)
Correct elective population	0.1
Removal of margin for adverse deviation	0.0
As at 31 March 2001	19.7

IV- Legislated Contribution Rates

The aggregate amount of death benefit payments projected for plan year 2002 is \$30.9 million, which is made up of \$24.6 million in respect of the term insurance and \$6.3 million in respect of the paid-up insurance. In this report, *term insurance* means the basic coverage (two times salary) less the 10% per year reduction applicable from age 61 and the \$5,000 paid-up insurance also applicable from age 65.

A- Paid-Up Insurance

For plan year 2002, the estimated single premium at age 65 for each \$5,000 of paid-up insured benefit is \$1,852 and \$1,456 for males and females, respectively. The corresponding legislated contribution rates for each \$5,000 of paid-up insured benefits are \$310 and \$291, respectively. The legislated contributions are determined on the basis of the original \$500 of paid-up insured benefit and were not readjusted when Bill C-55 increased the paid-up insured benefit from \$500 to \$5,000.

The assumed improvements in longevity cause the projected single premium for the paid-up insurance to decrease over time. However, the projected ultimate yield of 6.0% is lower than the yield of 8.72% projected for plan year 2002. This has the effect of gradually increasing the projected single premium over the years.

The net effect of longevity improvements and decreasing projected yields is to increase the projected single premiums at age 65 for each \$5,000 of paid-up insured benefit. A male participant's projected single premium increases from \$1,852 for plan year 2002 to \$1,955 for plan year 2025; for a female participant the increase is from \$1,456 to \$1,549. The corresponding legislated contribution rates for each \$5,000 of paid-up insured benefit are only \$310 and \$291, respectively.

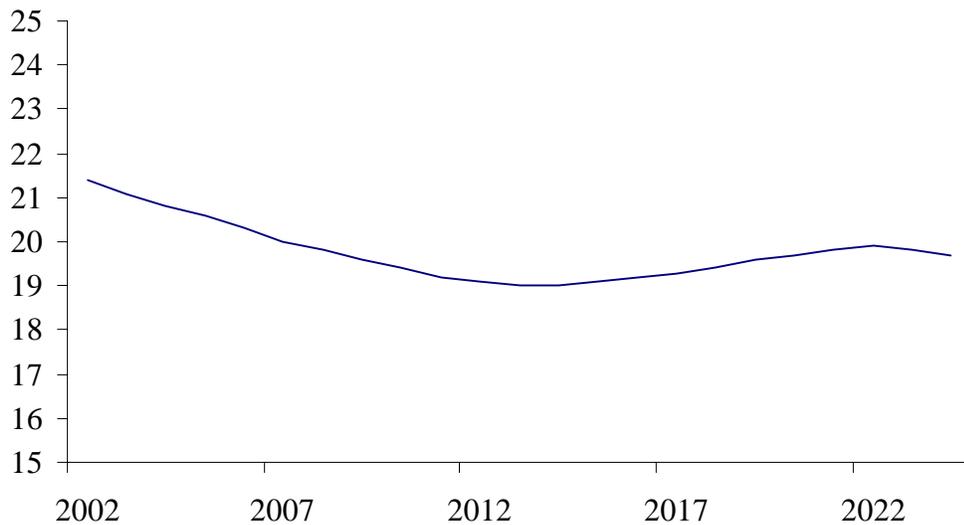
B- Term Insurance

The total amount of term insurance proceeds projected to be payable during plan year 2002 is \$24.6 million. Given that the total amount of term insurance projected to be in force for plan year 2002 is \$9,487 million, the benefit cost rate projected for plan year 2002 is 21.6 cents per month per \$1,000 of term insurance.

Non-elective participants and elective participants in receipt of an immediate annuity are required to contribute monthly 20 cents per \$1,000 of salary or, 9.96¹ cents per \$1,000 of term insurance. As a minimum, the Government contributes monthly an amount equal to one-twelfth of the actual total amount of term insurance proceeds payable during the month. For plan year 2002, the Government's monthly contribution is estimated at 1.8 cents per \$1,000 of insured benefit.

The total amount contributed by participants and the government is therefore 11.8 cents (9.96 cents plus 1.8 cents) per month per \$1,000 of term insurance, i.e. significantly less than the estimated monthly cost of 21.6 cents per \$1,000 of term insurance for plan year 2002.

Figure 2
Project Monthly Cost (Cents Per \$1,000 of Term Insurance)



As shown in figure 2, the monthly cost per \$1,000 of term insurance is projected to decrease from 21.6 cents to 19.0 cents in the first 15 years. Thereafter the monthly cost is projected to gradually approach 19.7 cents by plan year 2025. This 19.7 cents cost compares to the combined (Government and participants) legislated contribution rate of 11.6 cents (i.e. 9.96 cents for participants plus one-twelfth of 19.7 cents for Government) projected for plan year 2025.

¹ If it were not for the rounding to the next lower multiple of \$250 of salary involved in the computation of contributions and the rounding to the next higher multiple of \$250 involved in the computation of the amount of insurance (twice the salary), the legislated contribution rate would be \$0.10 (i.e. \$0.20 divided by two) instead of \$0.0996.

Table C illustrates the projected monthly costs per \$1,000 of term insurance for selected plan year and participant type.

Table C
Projected Monthly Cost (Cents Per \$1,000 of Term Insurance)

<u>Participants</u>	<u>2002</u>	<u>2010</u>	<u>2020</u>	<u>2025</u>
Non-elective	8.3	8.3	7.7	7.6
Elective	<u>42.0</u>	<u>36.2</u>	<u>40.6</u>	<u>45.4</u>
All	21.6	19.6	19.6	19.7

For non-elective participants, the monthly cost projected for plan year 2025 is 92% of the monthly cost estimated for plan year 2002. This results mainly from the following two factors:

- There is a reduction in cost due to the assumed lower mortality for plan year 2025 in accordance with the longevity improvement factors shown in table 6H applied to the current mortality rates shown in table 6G.
- The distribution of non-elective participants in the plan year 2025 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 mortality improvements.

In respect of elective participants in receipt of an immediate annuity, the monthly cost projected for plan year 2025 is 108% of the monthly cost projected for plan year 2002. This increase is mostly the result of the distribution of elective participants weighted more heavily at the older ages than currently.

For all plan participants in aggregate, the monthly cost projected for plan year 2025 is 91% of the monthly cost projected for plan year 2002.

V- Actuarial Opinion

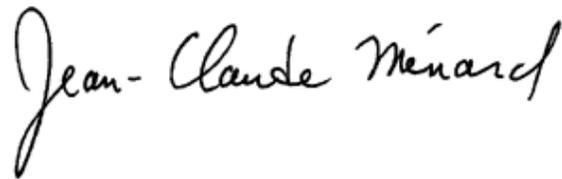
This report was prepared pursuant to the *Public Pensions Reporting Act* per section 71 of the *Canadian Forces Superannuation Act*. In our opinion,

- the valuation data on which it is based are sufficient but incomplete, as noted in section I-C;
- the assumptions that have been used are, in aggregate, appropriate;
- the methodology employed is appropriate; and
- the value of assets exceeds the wind-up liabilities at the valuation date.

This report has been prepared, and our opinions 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.



Daniel Hébert
Principal Actuary
Public Sector Insurance and Pension Programs
Fellow of the Canadian Institute of Actuaries
Fellow of the Society of Actuaries



Jean-Claude Ménard
Chief Actuary
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Ottawa, Canada
18 January 2002

APPENDICES

Appendix 1 - Summary of Plan Provisions

Following is a summary description of the main provisions of the life insurance plan established for the members of the regular force under Part II - *Supplementary Death Benefits* of the *Canadian Forces Superannuation Act* (CFSA). This plan supplements the pension plan by providing a lump sum benefit upon the death of an insured participant.

I- Plan Participants

A- Non-Elective Participants

Non-elective participant means a member of the regular force, or a member of the reserve force who is, with the approval of the Chief of the Defence Staff, on full-time service in a position in a regular force establishment or as a supernumerary to a regular force establishment.

B- Elective Participants

Elective participant means all previously non-elective participants who have ceased to be employed in the Canadian Forces by reason of disability or retirement (i.e. when they become entitled to an immediate retirement or disability annuity) and elected to continue coverage under the Regular Forces Death Benefit (RFDB) plan. Such right is limited to members who, at the time they cease to be employed in the Canadian Forces, had completed at least five years of continuous service in the Canadian Forces or five years of membership in the RFDB plan.

Elective participants entitled to a deferred annuity under the CFSA upon cessation of employment may elect to continue their full coverage under the RFDB plan; otherwise their membership and coverage 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 a participant exercises the right of election for continuous coverage.

An elective participant who becomes a participant in the Public Service Death Benefit (PSDB) plan automatically ceases to be a participant in the RFDB. Any such person, who subsequently ceases to be a participant in the PSDB plan, without entitlement to an immediate annuity under the *Public Service Superannuation Act*, is deemed thereupon to regain the status of elective participant in the RFDB.

II- Assets

The plan is financed through the Regular Forces Death Benefit (RFDB) Account, which forms part of the Accounts of Canada. The Account is credited with all contributions made by the participants and the Government, and charged with all benefit payments as they become due. The Account is also credited with investment earnings based on interest rates applying to the Canadian Forces Superannuation Account.

III- Contributions

A- Non-Elective Participants, and Elective Participants in Receipt of an Immediate Annuity

For non-elective participants as well as elective participants in receipt of an immediate annuity (disability or retirement) under Part I of the CFSA or the *Defence Services Pension Continuation Act*, the legislated contribution rate is 5 cents per month for each \$250 of salary (for this purpose the salary is in practice rounded to the next lower multiple of \$250 if not already equal to such a multiple). When these participants attain age 65 (or complete five years of service, if later), their contribution is reduced by 50 cents per month in recognition of the fact that \$5,000 of insured death benefit becomes paid-up (by the Government) for the remaining lifetime of the participant.

B- Elective Participants Entitled to a Deferred Annuity

For elective participants entitled to a deferred annuity, the legislated contribution rate varies in accordance with the attained age of the participant, and the corresponding contributions become chargeable on the 30th day immediately following cessation of employment. The legislated rates for selected ages are shown in the following table:

Table 1A
Contribution per \$2,000 of Insured Benefit

<u>Age Last Birthday</u>	<u>Annual</u>	<u>Monthly</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

C- Government

The Government credits monthly to the Regular Force Death Benefit (RFDB) Account an amount equal to one-twelfth of the total amount of term insurance death benefits paid in the month.

When a participant, other than one entitled to a deferred annuity, reaches age 65 (or completes five years of service, if later), the Government credits to the RFDB Account a single premium for the individual \$5,000 paid-up portion of insured benefit in respect of which contributions are no longer required from the participant.

The legislated amount of single premium for each such \$5,000 paid-up portion of insured benefit is shown in the following table and corresponds to one-tenth of \$5,000 times the single premium rate for each dollar of insured benefit, computed on the basis of the Life Tables, Canada, 1950-1952 and interest at 4% per annum.

Table 1B
Legislated Single Premium per \$5,000 of Insured Benefit

<u>Age Last Birthday</u>	<u>Male</u>	<u>Female</u>
65	\$310	\$291
66	316	298
67	323	306
68	329	313
69	336	320

Under the statutes, if for whatever reason the RFDB Account were to become exhausted, the Government would then have to make special contributions to the Account in an amount at least equal to the death benefits then due but not paid by reason of such cash shortfall.

IV- Amount of Insured Death Benefit

Subject to the applicable reductions described below, the lump sum benefit payable upon the death of a participant is equal to twice the participant's current salary, the result being rounded to the next higher multiple of \$250 if not already equal to such a multiple. For this purpose, the current salary of an elective participant is defined as the annual rate of pay at the time of cessation of employment in the Canadian Forces.

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

- For those elective participants 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, within one year following the introduction of Bill C-55, to keep their insured death benefit at \$500, the floor value is \$500 instead of \$5,000. Such election is irrevocable.
- For elective participants entitled to a deferred annuity there is no coverage past age 70.

Upon ceasing to be employed in the Canadian Forces, elective participants in receipt of an immediate annuity under Part I of the CFSA or the *Defence Services Pension Continuation Act* may opt to reduce their amount of insured death benefit to \$5,000.

Appendix 2 - Plan Assets

Regular Forces Death Benefit Account

The plan is entirely financed through the Regular Forces Death Benefit Account, which forms part of the Accounts of Canada. The Account is:

- credited with all contributions made by participants and the Government;
- credited with investment earnings every three months on the basis of the actual average yield for the same period on the combined Superannuation Accounts of the Public Service, Canadian Forces and Royal Canadian Mounted Police pension plans. These accounts generate investment earnings as though net cash flows were invested quarterly in 20-year Government of Canada bonds issued at prescribed interest rates and held to maturity;
- charged with death benefit payments when they become due.

Table 2A shows the reconciliation of assets in the Regular Forces Death Benefit Account from the last valuation date to the current valuation date¹. Since the last valuation, the Account balance has grown by \$15 million (i.e. a 9% increase) to reach \$186 million as at 31 March 2001. The net growth in the Account balance is to a large extent the result of investment earnings credited to the Account.

Table 2A
Regular Force Death Benefit Account

Plan year	(in millions of dollars)				
	1998	1999	2000	2001	1998-2001
Account Balance as at 31 March 1997					170.8
Accounts of Canada opening balance	170.8	176.0	179.3	182.1	170.8
INCOME					
Employee contributions	10.2	10.5	11.0	11.1	42.8
Employer contributions					
- Term insurance	1.6	1.8	1.7	1.7	6.9
- Paid-up insurance	0.7	0.6	0.6	0.6	2.5
Investment earnings	<u>16.6</u>	<u>16.4</u>	<u>16.3</u>	<u>16.0</u>	<u>65.3</u>
Subtotal	29.0	29.4	29.7	29.5	117.6
EXPENDITURES					
Death claims	23.9	26.0	26.9	25.4	102.2
Accounts of Canada closing balance	176.0	179.3	182.1	186.2	186.2
Account Balance as at 31 March 2001					186.2

¹ Some totals in this page might err by a margin of \$0.1 million due to rounding.

Rates of Return

The following rates of return on the Regular Forces Death Benefit Account by plan year were calculated using the foregoing entries.

<u>Plan Year</u>	<u>Return</u>
1998	10.03%
1999	9.71%
2000	9.42%
2001	9.09%

Sources of Asset Data

The Account entries shown previously were taken from the Accounts of Canada. In accordance with section 8 of the *Public Pensions Reporting Act*, the Office of the Comptroller General of Canada provided a certification of the assets of the plan as at 31 March 2001.

Account Projection

Table 2C shows a projection of the Regular Forces Death Benefit Account over 25 years commencing 1 April 2000.

Table 2C

Plan Year	Balance Sheet at the End of Plan Year			Ratio of Projected Actuarial Surplus at the End of the Plan Year to Annual Benefit Payments Projected for the Following Plan Year
	Account ¹	Liabilities	Surplus / Deficit	
2000	182.1	67.2	114.9	4.5
2001	186.2	72.2	114.0	3.7
2002	184.9	75.5	109.4	3.5
2003	182.6	78.7	103.9	3.2
2004	179.4	81.8	97.6	3.0
2005	175.2	84.5	90.7	2.7
2006	170.1	87.1	83.0	2.4
2007	163.9	89.5	74.4	2.1
2008	156.7	91.8	64.9	1.8
2009	148.5	93.8	54.7	1.5
2010	139.1	95.3	43.8	1.2
2011	128.5	96.3	32.2	0.9
2012	116.6	97.8	18.8	0.5
2013	103.3	99.0	4.3	0.1
2014	88.6	100.0	(11.4)	-
2015	72.3	100.6	(28.3)	-
2016	54.2	100.5	(46.3)	-
2017	34.4	100.5	(66.1)	-
2018	12.6	100.4	(87.8)	-
2019	0.0	100.5	(100.5)	-
2020	0.0	101.0	(101.0)	-
2021	0.0	102.1	(102.1)	-
2022	0.0	103.6	(103.6)	-
2023	0.0	105.8	(105.8)	-
2024	0.0	108.1	(108.1)	-
2025	0.0	111.0	(111.0)	-

¹ Bold figures denote actual experience.

Income and Expenditure Projection

Table 2D shows a projection of the income and expenditure which served as the basis of the projection of the Regular Forces Death Benefit Account over 25 years commencing with plan year 2001.

Table 2D
Income and Expenditure During the Plan Year
(in millions of dollars)

Plan Year	Contributions				Benefit Payments			Investment	Net
	Participants ¹	Government Term ²	Paid-Up	Total	Term	Paid-Up	Total	Earnings	Cash Flow
2001	11.1	1.7	0.6	13.5	20.3	5.1	25.4	16.0	4.1
2002	11.3	2.0	0.7	14.0	24.6	6.3	30.9	15.5	(1.3)
2003	11.6	2.1	0.6	14.4	25.0	6.5	31.5	14.8	(2.3)
2004	12.0	2.1	0.6	14.7	25.4	6.8	32.1	14.2	(3.2)
2005	12.3	2.1	0.6	15.1	25.8	7.0	32.7	13.5	(4.2)
2006	12.7	2.2	0.6	15.5	26.2	7.2	33.4	12.7	(5.2)
2007	13.1	2.2	0.6	15.9	26.7	7.3	34.0	11.9	(6.2)
2008	13.6	2.3	0.6	16.4	27.2	7.5	34.7	11.2	(7.1)
2009	14.0	2.3	0.6	16.9	27.8	7.7	35.5	10.3	(8.2)
2010	14.5	2.4	0.5	17.4	28.5	7.8	36.3	9.5	(9.4)
2011	15.1	2.4	0.5	18.0	29.3	7.9	37.2	8.6	(10.6)
2012	15.6	2.5	0.6	18.8	30.1	8.0	38.1	7.4	(11.9)
2013	16.2	2.6	0.6	19.4	31.1	8.1	39.2	6.5	(13.3)
2014	16.9	2.7	0.6	20.1	32.2	8.2	40.4	5.6	(14.7)
2015	17.5	2.8	0.5	20.8	33.4	8.3	41.7	4.6	(16.3)
2016	18.2	2.9	0.4	21.5	34.8	8.3	43.2	3.5	(18.1)
2017	18.9	3.0	0.5	22.4	36.3	8.4	44.7	2.4	(19.9)
2018	19.6	3.2	0.5	23.3	37.9	8.4	46.3	1.3	(21.8)
2019	20.3	14.6	0.5	35.5	39.6	8.5	48.1	0.0	(12.6)
2020	21.1	28.2	0.6	49.9	41.4	8.5	49.9	0.0	0.0
2021	21.8	29.2	0.7	51.7	43.2	8.6	51.7	0.0	0.0
2022	22.6	30.1	0.8	53.5	44.9	8.6	53.5	0.0	0.0
2023	23.3	30.9	0.9	55.1	46.4	8.7	55.1	0.0	0.0
2024	24.1	31.6	0.9	56.6	47.8	8.8	56.6	0.0	0.0
2025	24.8	32.0	1.0	57.8	48.9	8.9	57.8	0.0	0.0

¹ Bold figures denote actual experience.

² When the Account is exhausted by plan year 2019, the Government is required by statute to make special contributions in an amount at least equal to the death benefits then due but not paid by reason of such cash shortfall.

Appendix 3 - Participant Data

Source of Participant Data

The Department of National Defence provided the valuation data required in respect of all participants as at 31 March 1999. The Superannuation Directorate of the Department of Public Works and Government Services Canada maintains master computer files for elective participants.

The main valuation data file supplied by the Superannuation Directorate contained all the status information of elective participants during the period from 1 April 1996 to 31 March 2001. The results of this valuation were based on the elective participants data as at 31 March 2001.

The non-elective participants provided as at 31 March 1999 were projected to 31 March 2001 using the demographic assumptions of the current valuation and the actual economic experience (general pay increases of 16.8% and 13.8% for Officers and Other Ranks respectively) for the relevant two-year projection period. These participants were further adjusted to reflect the number of members as at 31 March 2001 as reported by the Department of National Defence.

As noted in section I-C, projected benefits during April 1999 to March 2001 were 13% higher than those shown in the Regular Force Death Benefit Account for the same period. One possible reason for this discrepancy could be that the participant data provided may not reflect the actual covered population. The real reason for this discrepancy will need to be resolved for the next valuation.

Participant Data Summary

Tables 3A to 3E on the following pages show the detailed participant data upon which this valuation is based.

Table 3A
Non-Elective Officers as at 31 March 1999

Age ¹	Number			Insured Benefits (\$ thousand)		
	Male	Female	Total	Male	Female	Total
15-19	289	115	404	7,123	2,773	9,896
20-24	1,044	304	1,348	45,873	13,402	59,275
25-29	1,484	284	1,768	135,127	25,075	160,202
30-34	2,054	303	2,357	231,718	33,905	265,623
35-39	2,711	260	2,971	339,200	31,353	370,553
40-44	1,792	181	1,973	246,077	22,973	269,050
45-49	1,175	97	1,272	169,881	13,040	182,921
50-54	788	36	824	119,026	5,020	124,046
55-59	<u>31</u>	<u>4</u>	<u>35</u>	<u>5,146</u>	<u>687</u>	<u>5,833</u>
Total	11,368	1,584	12,952	1,299,171	148,228	1,447,399

Average	Male	Female	Total
Age ¹	35.8	31.5	35.3
Service ¹	14.9	9.9	14.2
Insured Benefit (\$)	114,283	93,577	111,751

¹ Expressed in completed years calculated at the beginning of the plan year.

Table 3B
Non-Elective Other Ranks as at 31 March 1999

Age ¹	Number			Insured Benefits (\$ thousand)		
	Male	Female	Total	Male	Female	Total
15-19	382	50	432	17,311	2,242	19,553
20-24	3,636	328	3,964	204,464	17,833	222,297
25-29	7,109	833	7,942	518,023	60,923	578,946
30-34	10,145	1,292	11,437	807,160	100,562	907,722
35-39	12,064	1,554	13,618	1,013,658	126,846	1,140,504
40-44	5,342	649	5,991	484,455	55,575	540,030
45-49	2,171	169	2,340	212,938	15,257	228,195
50-54	839	24	863	86,991	2,226	89,217
55-59	4	0	4	470	0	470
Total	41,692	4,899	46,591	3,345,470	381,464	3,726,934

Average	Male	Female	Total
Age ¹	34.0	33.9	34.0
Service ¹	13.4	12.3	13.3
Insured Benefit (\$)	80,243	77,866	79,993

¹ Expressed in completed years calculated at the beginning of the plan year.

Table 3C
Elective Disabled (3A) Participants as at 31 March 2001

Age ¹	Number			Insured Benefits (\$ thousand)		
	Male	Female	Total	Male	Female	Total
25- 29	0	1	1	0	85	85
30- 34	5	2	7	389	167	556
35- 39	39	14	53	3,284	1,112	4,396
40- 44	61	17	78	4,950	1,376	6,326
45- 49	37	13	50	2,780	1,030	3,810
50- 54	96	11	107	4,817	986	5,803
55- 59	249	3	252	8,608	233	8,841
60- 64	467	1	468	8,676	35	8,711
65- 69	694	1	695	4,486	6	4,492
70- 74	656	5	661	3,276	25	3,301
75- 79	400	3	403	2,000	15	2,015
80- 84	175	0	175	875	0	875
85- 89	33	1	34	165	5	170
90- 94	3	0	3	15	0	15
Total	2,915	72	2,987	44,321	5,075	49,396

Average	Male	Female	Total
Age ¹	67.3	48.3	66.8
Insured Benefit (\$)	15,204	70,462	16,536

¹ Expressed in completed years calculated at the beginning of the plan year.

Table 3D
Elective Retired and Disabled (3B) Participants as at 31 March 2001

Age ¹	Number			Insured Benefits (\$ thousand)		
	Male	Female	Total	Male	Female	Total
25-29	9	5	14	765	445	1,210
30-34	253	69	322	21,535	6,075	27,610
35-39	2,102	438	2,540	181,763	35,804	217,567
40-44	5,686	934	6,620	509,112	77,617	586,729
45- 49	5,479	569	6,048	502,645	50,243	552,888
50- 54	7,513	349	7,862	690,317	31,974	722,291
55- 59	9,026	131	9,157	808,532	12,426	820,958
60- 64	9,908	107	10,015	566,297	7,330	573,627
65- 69	9,307	66	9,373	159,672	1,402	161,074
70- 74	6,303	53	6,356	31,511	265	31,776
75- 79	4,905	26	4,931	24,525	130	24,655
80- 84	3,057	40	3,097	15,285	200	15,485
85- 89	1,110	21	1,131	5,550	105	5,655
90- 94	139	5	144	695	25	720
95- 99	<u>6</u>	<u>1</u>	<u>7</u>	<u>30</u>	<u>5</u>	<u>35</u>
Total	64,803	2,814	67,617	3,518,234	224,046	3,742,280

Average	Male	Female	Total
Age ¹	60.5	47.2	59.9
Insured Benefit (\$)	54,291	79,618	55,345

Table 3E
Elective Participants Entitled to a Deferred Annuity² as at 31 March 2001

Number	Insured Benefits (\$ thousand)
27	2,659

¹ Expressed in completed years calculated at the beginning of the plan year.

² Due to their negligible effect on costs and liabilities, these participants were not taken into consideration for the purpose of this valuation.

Appendix 4 - Methodology

I- Assets

The assets of the plan consist essentially of the recorded balance in the Regular Forces Death Benefit (RFDB) Account, which forms part of the Accounts of Canada. These assets are shown at the book value of the underlying notional bond portfolio described in Appendix 3.

The Account balance corresponds to the excess of past contributions and investment earnings over past benefit payments. Assets are accordingly projected to the end of a given plan year by adding to the Account at the beginning of that plan year the net income (i.e. the excess of contributions and investment earnings over benefits) projected as described below for that plan year. Administration expenses are ignored because they are not charged to the Account.

II- Contributions

Participants' annual contributions are projected for a given plan year by multiplying

- the legislated annual contribution rate of 60 cents per \$250 of salary (equivalent to the monthly rate of 5 cents per \$250 of salary) by
- the projected participants' rounded salaries for that plan year on an open-group basis, reduced by 10% a year from age 61 if applicable, (the legislation expresses the annual reduction of 10% a year on the total amount of coverage)

less

- \$6.00 annually corresponding to the \$5,000 paid-up coverage after age 65, if applicable (i.e. a death benefit coverage of \$5,000 corresponds to an annual salary of \$2,500, hence an annual contribution of 60 cents per \$250 of salary would produce a reduction of \$6.00 annually).

Non-elective participants' salaries are projected for a given plan year using the assumed rates of increase described in Appendix 6 below. Elective participants' salaries are frozen at time of retirement or disability and are not subject to further increases.

The Government's annual contribution is projected for a given plan year as the sum of

- one-twelfth of the amount of term insurance death benefits projected to be paid during that plan year, and
- the legislated single premiums in respect of relevant participants 65 years of age (or participants completing five years of service, if older).

III- Investment Earnings

Annual investment earnings are projected for a given plan year as the product of the yield projected for that plan year (Appendix 6) and the projected average Account balance in that plan year.

IV- Benefits

The total amount of death benefits (term and paid-up insurance) for a given plan year is projected as the total amount of insurance in force during that plan year multiplied by the mortality rates assumed to apply during that plan year. The amount of insurance in force depends on the salary projected to time of death. Salaries are projected for this purpose using the assumed rates of increase in salaries and the number of participants projected on an open-group basis as described in Appendix 7 below.

V- Liabilities

A- Paid-up Reserve

At the end of a given plan year, the liabilities associated with the individual \$5,000 paid-up insurance in force correspond to the amount which, together with interest at the projected yields, is sufficient to pay for each individual \$5,000 paid-up death benefit projected payable on the basis of the assumed mortality rates.

B- IBNR and Pending Claims Reserves

On the basis of the plan's experience, the reserve at the end of a given plan year for claims incurred but not reported (IBNR), and for pending claims is set equal to one-sixth of the projected annual benefits paid on average during the six previous plan years.

C- Extension of Coverage

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 in respect of that term insurance provision.

Appendix 5 - Economic Assumptions

The following economic assumptions are required for valuation purposes:

Increases in Average Earnings

The assumed increase in non-elective participants' annual salary would normally, for any year, be the same as the assumed increase in the Industrial Aggregate of Average Weekly Earnings. However, it was adjusted for the first year to reflect current contract settlements in the Public Service.

Projected Yields on Account

These yields are required for the estimates of the long-term projection of the assets, liabilities and actuarial surplus or deficit. The methodology used to determine the projected yields on the Account is described in Appendix 5.

Table 5
Summary of Economic Assumptions

Plan Year	Average Salary Increase ¹ (Non-Elective Participants)	Projected Yield
2001	6.0	9.01
2002	2.5	8.72
2003	2.6	8.41
2004	2.6	8.19
2005	2.7	7.92
2006	2.8	7.65
2007	2.9	7.42
2008	3.0	7.23
2009	3.2	7.02
2010	3.3	6.82
2011	3.5	6.62
2012	3.6	6.28
2013	3.7	6.11
2014	3.8	5.99
2015	3.9	5.88
2016	4.0	5.75
2017	4.0	5.66
2018	4.0	5.60
2019	4.0	5.61
2020	4.0	5.63
2021	4.0	5.63
2022	4.0	5.65
2023	4.0	5.68
2024	4.0	5.71
2025	4.0	5.76

¹ Exclusive of seniority and promotional increases

Appendix 6 - Demographic and Other Assumptions

Except where otherwise noted, all demographic assumptions were determined from the plan's own experience. Where applicable, assumptions of the previous valuation were updated to reflect the available intervaluation experience (usually April 1996 to March 1999). Described below are the assumptions related to causes of termination (employment or participation):

Description	Rate Basis	Comments	Table	
Non-elective participants				
Termination (withdrawal or retirement), other than for disability, with less than 20 years of service	Service, Rank, Sex	Giving partial credibility to the experience data of the 1998 and 1999 plan years, (the experience data for plan year 1997 was excluded as it was deemed to fall under the Force reduction plan) the rates were modified from the previous valuation as follows:		
		Male Officers	- 25% increase	6B
		Male Other Ranks	- 18% increase	
		Female Officers	- 10% increase	
		Female Other Ranks	- 7% increase	
Pensionable termination with 20 or more years of service	Service, Rank	Giving partial credibility to the experience data of the 1998 and 1999 plan years, (the experience data for plan year 1997 was excluded as it was deemed to fall under the Force reduction plan) the rates were modified from the previous valuation as follows:	6D	
		Officers	- 7% increase	
		Other Ranks	- 3% increase	
Disability	Occupation Age, Rank, Sex	In 1991, the disability benefit provisions were made the same irrespective of the type of disability releases, either 3A (any occupation) or 3B (own occupation). Since it is expected that the mortality experience of 3B disabled pensioner be similar to healthy pensioner, we recognized for the first time that disability incidence differs between the 3A and 3B causes of release.	6E	
		Overall, the new incidence rates are marginally higher than in the previous valuation		
Mortality	Age, Rank, Sex, Year	On the basis of the experience for the covered population, the rates below age 60 were decreased and the rates above age 70 were increased.	6F	
		Longevity improvements were based on a 24-year select period with an ultimate longevity improvement of 0.5% at all ages below age 101.	6H	

Description	Basis	Comments	Table
Elective retired participants			
Mortality	Age, Rank, Sex, Year	On the basis of the experience for the covered population, the rates below age 60 were decreased and the rates above age 70 were increased.	6F
		Longevity improvements as non-elective mortality.	6H
Proportion of elective participants with 10 to 19 years of service electing an immediate annuity	Service, Rank	Giving partial credibility to the experience data of the 1998 and 1999 plan years, the proportions were set at approximately 80% greater than the proportions assumed in the previous report for both Officers and Other Ranks.	6C
Elective disabled participant			
Disabled life mortality (3A release)	Age, Rank Sex, Year	On the basis of the plan's experience, the rates assumed in the previous valuation for 1996 were maintained but projected three years to account for longevity improvements from 1996 to 1999. For the first time, the same mortality rates were assumed for female Officers and Other Ranks. Additionally, the mortality rates from age 75 slowly grade to the elective retired participants' mortality over a period of 15 years.	6G
		Longevity improvements as non-elective mortality	6H
Disabled life mortality (3B release)	Age, Rank Sex, Year	These members have been released under cause 3B, and are unable to perform the duties of their own occupations. The mortality assumption for these elective disabled participants is set equal to the mortality assumption of elective retired participants.	6F
		Longevity improvements as non-elective mortality	6H

Other Demographic Assumptions

Option to Reduce Coverage to \$5,000

The valuation data indicates that the proportion of elective participants opting to reduce their insured death benefit to \$5,000 is negligible. Accordingly, no elective participants were assumed to make such an option.

Electing Participants Opting to Continue Coverage After Employment Termination

The valuation data indicate that the proportion of elective participants, in receipt of an immediate annuity, electing not to continue their coverage under the RFDB is negligible. Accordingly, all such elective participants were assumed to continue coverage when they cease to serve in the Canadian Forces.

Seniority and Promotional Salary Increases

Based on the experience for plan years 1997 to 1999, the rates of both Officers and Other Ranks were revised. The rates for Officers and other Ranks are respectively 6% and 8% lower than the previous ones. For the first time membership data included historical annual salary information that indicated a substantial increase in salary of Officers at around duration four. Most Officers are paid a fairly low annual salary while attending school and upon graduation salaries are increased significantly as these Officers become fulltime members of the Canadian Forces. The assumptions for seniority and promotional increases, broken down by years of service, are shown in table 6A.

New Participants

It was assumed that the distribution of new members by age, sex and initial salary rate would be the same as that of members with less than one year of service at the valuation date. For the first year following the valuation date, the non-elective participants population was reduced to match census data supplied by the Department of National Defence. In subsequent years, the number of new entrants was assumed to be equal to the year's number of terminations.

Other Assumptions

Administrative Expenses

In the projection of the Account, no assumption was made regarding the expenses incurred for the administration of the plan. These expenses, which are not charged to the RFDB Account, are borne by the Government and are commingled with all other government expenses.

Table 6A
Assumed Seniority and Promotional Salary Increases

<u>Service¹</u>	<u>Officer (%)</u>	<u>Other Rank (%)</u>	<u>Service¹</u>	<u>Officer (%)</u>	<u>Other Rank (%)</u>
0	4.0	17.4	20	1.2	1.1
1	6.2	15.6	21	1.2	1.1
2	13.6	13.3	22	1.1	1.1
3	52.3	10.5	23	1.0	1.1
4	19.4	7.7	24	0.9	1.1
5	11.7	5.4	25	0.9	1.0
6	7.9	3.7	26	0.8	1.0
7	5.9	2.6	27	0.7	1.0
8	4.9	2.0	28	0.7	1.0
9	4.2	1.5	29	0.6	0.9
10	3.7	1.2	30	0.5	0.9
11	3.3	1.0	31	0.5	0.9
12	2.9	0.9	32	0.5	0.8
13	2.5	0.9	33	0.5	0.8
14	2.2	0.9	34	0.5	0.8
15	2.0	1.0	35	0.5	0.7
16	1.8	1.0	36	0.5	0.6
17	1.6	1.1	37	0.5	0.5
18	1.5	1.1	38	0.5	0.4
19	1.3	1.1	39	0.0	0.0

¹ Expressed in completed years calculated as at the beginning of the plan year.

Table 6B
Assumed Annual Rates of Termination
for Elective Participants With Less Than 19 Years of Service
(per 1,000 people)

Service ¹	Officers		Other Ranks	
	Male	Female	Male	Female
0	59	94	42	56
1	52	73	54	60
2	46	57	119	81
3	40	50	87	90
4	35	51	70	87
5	35	61	60	82
6	41	76	54	75
7	53	89	46	67
8	64	93	35	61
9	64	88	33	60
10	54	78	32	58
11	46	68	27	47
12	39	53	23	37
13	32	41	16	31
14	26	31	14	26
15	22	26	13	20
16	20	20	11	15
17	17	18	11	13
18	13	17	11	13

¹ Expressed in completed years calculated as at the beginning of the plan year.

Table 6C
Assumed Proportions of Elective Participants With 10 to 19 Years of Service
Continuing Coverage Upon Termination
(per 1,000 people)

<u>Service¹</u>	<u>Officers</u>	<u>Other Ranks</u>
9	30	13
10	42	23
11	57	37
12	77	57
13	106	86
14	147	128
15	210	189
16	307	281
17	455	424
18	675	648
19	1,000	1,000

¹ Expressed in completed years calculated as at the beginning of the plan year.

Table 6D
Assumed Rates of Termination for Elective Participants
With 19 or More Years of Service
(per 1,000 people)

Service ¹	Officers	Other Ranks
19	92	87
20	75	94
21	73	75
22	71	66
23	63	99
24	53	130
25	57	117
26	77	106
27	97	111
28	101	120
29	105	162
30	110	178
31	125	189
32	150	209
33	196	243
34	267	320
35	335	416
36	386	518
37	417	626
38	427	626

¹ Expressed in completed years calculated as at the beginning of the plan year.

Table 6E
Sample of Assumed Rates of Termination due to Disability
(per 1,000 people)

Age ¹	Any Occupation		Own Occupation		
	Male	Female	Male Officers	Male Other Ranks	Female Officers and Other Ranks
20	0.4	0.4	3.0	2.8	4.7
25	0.3	0.7	2.8	4.0	5.8
30	0.2	1.3	1.3	7.7	7.7
35	0.4	1.7	1.4	10.8	10.5
40	0.6	2.5	1.6	9.7	12.6
45	0.6	3.6	2.7	9.0	13.7
50	1.2	5.0	4.4	10.5	15.2
55	2.6	6.8	5.6	13.1	17.0
59	4.2	8.2	6.5	15.3	18.5

¹ Expressed in completed years calculated as at the beginning of the plan year.

Table 6F
Sample of Assumed Mortality Rates for Plan Year 2001
for Elective Participants, Non-Elective Retired and Disabled (3B) Participants
(per 1,000 people)

Age ¹	Male		Female
	Officers	Other Ranks	Officers and Other Ranks
20	0.4	0.4	0.3
25	0.5	0.5	0.3
30	0.6	0.6	0.4
35	0.7	0.8	0.5
40	0.8	1.2	0.7
45	1.3	2.0	1.0
50	2.0	3.5	1.4
55	3.2	6.5	2.4
60	6.0	10.9	4.8
65	11.2	18.5	9.3
70	20.2	31.0	15.6
75	38.2	50.7	25.9
80	69.3	79.7	41.7
85	114.6	125.0	69.3
90	176.2	193.1	119.1
95	255.3	298.6	192.9
100	338.2	369.9	291.6
105	444.0	447.6	406.4
110	500.0	500.0	482.3
115	1,000.0	1,000.0	1,000.0

¹ Expressed in completed years calculated as at the beginning of the plan year.

Table 6G
Sample of Assumed Mortality Rates for Plan Year 2001
in Respect of Elective Disabled (3B) Participants
(per 1,000 people)

Age ¹	Male		Female
	Officers	Other Ranks	Officers and Other Ranks
20	0.8	1.2	0.5
25	0.8	1.2	0.5
30	0.8	2.7	0.6
35	1.0	4.6	0.8
40	1.3	6.4	1.2
45	3.2	7.7	2.0
50	8.4	9.2	3.3
55	14.3	13.0	5.3
60	19.9	19.9	8.5
65	26.6	30.0	13.1
70	35.9	48.3	20.9
75	52.7	71.3	34.2
80	77.0	86.7	53.2
85	111.7	112.6	84.8
90	150.4	158.2	134.0
95	222.9	230.5	194.5
100	316.8	323.3	291.1
105	495.7	495.7	415.2
110	500.0	500.0	492.4
115	1,000.0	1,000.0	1,000.0

¹ Expressed in completed years calculated as at the beginning of the plan year.

Table 6H
Sample of Assumed Longevity Improvement Factors

Age ²	Annual Percentage of Mortality Reduction ¹			
	Male		Female	
	2002	2026 and later	2002	2026 and later
20	2.42	0.50	1.46	0.50
25	1.46	0.50	1.22	0.50
30	0.50	0.50	0.98	0.50
35	0.26	0.50	1.22	0.50
40	0.98	0.50	1.22	0.50
45	1.94	0.50	1.46	0.50
50	2.42	0.50	1.22	0.50
55	2.18	0.50	0.98	0.50
60	2.18	0.50	0.98	0.50
65	1.94	0.50	1.22	0.50
70	1.94	0.50	1.46	0.50
75	1.70	0.50	1.22	0.50
80	1.22	0.50	1.22	0.50
85	0.98	0.50	0.98	0.50
90	0.74	0.50	0.74	0.50
95	0.50	0.50	0.50	0.50
100	0.26	0.50	0.26	0.50
105+	0.00	0.00	0.00	0.00

¹ Mortality improvement is based on a 24-year select period with an ultimate annual mortality improvement of 0.5% at all ages. During the select period, the annual mortality reduction is linearly interpolated between 2002 and 2026.

² Expressed in completed years calculated at the beginning of the plan year.

Appendix 7 - Acknowledgements

The Office of the Comptroller General of Canada provided a certification of the assets of Regular Forces Death Benefit Account as at 31 March 2001.

The Department of National Defence provided relevant valuation data on participants. Public Works and Government Services Canada also provided additional information in respect of elective participants.

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