PUBLIC SERVICE SUPERANNUATION ACT - PART I

ACTUARIAL REPORT
ON THE
SUPERANNUATION ACCOUNT
AS AT
DECEMBER 31, 1977

Department of Insurance
Ottawa, Ontario
K1A OH2

Public Service Superannuation Act - Part 1

Report on the Actuarial Examination of the Superannuation Account in the Consolidated Revenue Fund as at December 31, 1977

Pursuant to section 35 of the Act we have made an actuarial examination of the Account as at December 31, 1977, and have the honour to report thereon. The report is divided into the following sections:

I. Introduction

The last examination of this Account was made as at December 31, 1972. Since that time a number of significant developments have taken place which have a direct or indirect bearing on this report.

A. Recent Amendments to the Public Service Superannuation Act

In 1975 significant changes were made in the Public Service Superannuation Act, the most important of which are as follows:

1. The Act was amended to provide for equality of status for male and female contributors. One amendment resulted in an increase in the contribution rate for females from 5.0% to 6.5% of salary (less Canada/Quebec Pension Plan Contributions), the rate for male contributors. Another amendment entitled the widower of a female contributor to the same benefits as the widow of a male contributor, provided the deceased contributor was a contributor or had 35 years of pensionable service and was employed in the Public Service on or after December 20, 1975.

2. Any contributor or beneficiary entitled to a return of contributions following the amendments became entitled, in addition, to receive interest on the accumulation of such contributions at the rate of 4% per annum after December 31, 1973.

3. Prior to the amendment, the Act provided for the payment upon the death of a contributor without eligible beneficiaries or the termination of all allowances to surviving beneficiaries, of any excess of the return of contributions benefit over the aggregate of all payments made to the contributor and/or his beneficiaries. By virtue of the amendment, the greater of the return of contributions benefit (including interest as described in (2) above) and five times the annuity to which the contributor was or would have been entitled at the time of his death was substituted for the return of contributions benefit in the calculation of the excess to be paid in respect of those contributors who were contributors or had 35 years of pensionable service and were employed in the Public Service on or after December 20, 1975.

B. <u>Supplementary Retirement Benefits Act</u>

The Supplementary Retirement Benefits Act, enacted in 1970 and amended in 1973, provides supplementary benefits related to increases in the cost of living to persons in receipt of annuities or annual allowances under various government superannuation and other acts, including the Public Service Superannuation Act. The provisions of the Supplementary Retirement Benefits Act have not affected the operation of the Public Service Superannuation Account. However, it was considered important to include a description and to present certain alternative methods of financing these benefits in Appendix 2 to this report, in order to give a more complete picture of the total pension provisions for contributors to the Superannuation Account.

C. <u>Valuation Assumptions</u>

In order to bring our practice into line with the generally preferred actuarial approach of choosing each assumption on its own merits and on as "realistic" a basis as may appear appropriate, some substantial changes in assumptions were made for purposes of this report. The various assumptions and their rationale are described in detail in Section III.

II. Description of Data and Membership Statistics

The basic data required for the statutory actuarial examinations of the Account in respect of contributors or their dependants entitled to annuities or annual allowances are maintained on computer files by the Superannuation Division of the Department of Supply and Services; data in respect of active contributors are maintained in a similar manner by the Personnel Data Systems Division of the same department.

Data concerning salaries of contributors as at December 31, 1977, and their total contributions paid to the same date were prepared by the various pay offices and merged with the basic records by matching Social Insurance Numbers.

The computer programming and processing of all the basic data was under the control of the Personnel Data Systems Division of the Department of Supply and Services. The same was true of most of the massive volume of calculations relating to contributors who were employed in the Public Service on December 31, 1977, or terminated employment in the preceding five years, for which statistics in summary form are shown in the following table.

Contributors Employed in the Public Service

	Contributors on Jan. 1, 1973	Entrants during the 1973-77 period	Terminations during the 1973-77 period					Contributors on Dec. 31, 1977
			Less than 5 years of pensionable service	Five or more years of pensionable service				
				Age(1)	Death	Disability(2)	Other(3)	
Males	174,788	118,888	58,472	19,768	2,723	3,504	9,881	199,328
Females	71,271	101,638	59,965	5,806	350	1,338	8,140	97,310
Total	246,059	220,526	118,437	25,574	3,073	4,842	18,021	296,638

Pertinent statistics derived from tabulations relating to persons entitled to annuities or annual allowances some time during the 1973-77 period are shown in the following tables.

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(1) Contributors who retired with entitlement to an immediate annuity at age 60 or over, or at ages 55 to 59 with 30 or more years of pensionable service.

(2) Contributors who ceased to be employed at ages under 60 because of disability. (The benefit received was either an immediate annuity, a cash termination allowance, or a return of contributions, with annuities accounting for about 96% of the cases).

(3) Contributors who ceased to be employed at ages under 55, or ages 55 to 59 with less than 30 years of service for reasons other than death or disability. (Subject to the restriction described in Note 10 in Appendix 1, the benefit was either a return of contributions, a deferred annuity or an annual allowance). Proportions electing deferred annuities or annual allowances are shown in Appendix 5.

Persons Entitled to an Annuity or Annual Allowance

Former Contributors

	Entitled Jan. 1, 1973	Who became entitled during the 1973-77 period	Who ceased to be entitled during the 1973-77 period: Died	Re-employed or recovered	Other*	Entitled Dec. 31, 1977: In Pay't	Deferred	Total
Males								
Entitlements for reasons other than disability	33,438	23,230	9,278	39	23	44,104	3,224	47,328
Entitlements because of disability	3,994	3,362	1,424	22	-	5,910	-	5,910
Total	37,432	26,592	10,702	61	23	50,014	3,224	53,238
Females								
Entitlements for reasons other than disability	11,739	7,744	1,536	16	22	16,104	1,805	17,909
Entitlements because of disability	1,793	1,023	320	8	-	2,488	-	2,488
Total	13,532	8,767	1,856	24	22	18,592	1,805	20,397
Grand Total	50,964	35,359	12,558	85	45	68,606	5,029	73,635

Surviving Spouses

	Entitled Jan. 1, 1973	Who became entitled during the 1973-77 period	Who ceased to be entitled during the 1973-77 period: Died	Remarried	Entitled Dec. 31, 1977
Widows	21,452	10,532	3,981	643	27,360
Widowers	-	87	3	4	80

Children and Students

	Entitled Jan. 1, 1973	Who became entitled during the 1973-77 period	Who ceased to be entitled during the 1973-77 period: Attained age 18 or age 25	Ceased to be eligible as a student	Entitled Dec. 31, 1977
Children	3,908	3,216	3,626**	-	3,498
Students	1,087	2,921	234	2,650	1,124

* Includes contributors who ceased to be entitled to deferred annuities upon becoming disabled and entitled to immediate annuities and who are included in new entitlements because of disability and contributors who elected the capitalized value of small annuities.

** Includes 1,901 children who qualified as students upon reaching 18 years of age and who are included in new entitlements as students.

III. Valuation Assumptions

A. General Comments

It is generally recognized that actuarial estimates of the cost of funding pensions are heavily dependent on the assumptions underlying the calculations, and that the choice of the economic assumptions tends to be among the most difficult.

In the past the only economic assumption made for determining pension liabilities and required credits to the Account was with regard to the rate of interest. The rate used was 4% p.a., which until 1969 was approximately the rate at which interest was being credited to the Account. Since July 1, 1969, total interest charged in respect of the Account was at the rate which would obtain on a fund in which the net proceeds in respect of the superannuation accounts for the Public Service, Canadian Forces and RCMP were invested in 20-year bonds having a yield equivalent to the average yield on Government of Canada bonds with 20 or more years to maturity outstanding at that time.

For purposes of the preceding report (as at December 31, 1972) the assumed valuation interest rate of 4% was retained. However, to the extent that future interest credits were expected to exceed that rate, implicit provision was being made for a certain rate of increase in the general level of salaries. This type of implicit provision appeared to be one of the possibilities contemplated, since the Act authorizes the Minister of Finance to apply interest credits in excess of the rate assumed for purposes of the preceding actuarial report towards the amortization of actuarial deficiencies, most of which have been attributable to the absence of an assumption for increases in the general level of salaries.

For this valuation it was decided to abandon the 4% interest assumption used in preceding valuations as well as the assumption of no future general increases in salaries in order to bring our approach more in line with the generally more favoured actuarial approach of selecting assumptions that might be regarded as appropriate and reasonably "realistic" each on its own merits as well as when considered together.

The primary purpose of treating this plan in a manner reflecting the practice for industrial pension plans is not to provide security through funding, but to account for pension costs in an appropriate and reasonably comparable fashion. Before discussing the various assumptions under individual headings, the following general comments relating to economic assumptions may help in judging the appropriateness of the choice.

(1) <u>Effect of explicit or implicit level of inflation determining the general level of economic assumptions</u>

There are three aspects to the discussion under this heading:

(a) To the extent that decisions by labour, business, government and other bodies as well as individuals are based on predictions regarding the behaviour of economic variables, the predictions will themselves influence these variables. Actuaries in their attempt to choose "realistic" assumptions risk reinforcing inflationary expectations, and this may be particularly so when actuarial reports are public documents as in the case of pension plans operated by governments or when the reports deal with the plans of major financial or industrial enterprises whose policies have important economic repercussions. It would seem that the greater the agreement regarding appropriate levels of economic assumptions, the greater the influence of the assumptions on the variables and the greater the likelihood that the actual level of inflation and the resulting actual levels of increases in salaries and of interest rates will exceed assumptions and predictions. Perhaps it is inevitable that, with few exceptions, the actual level of inflation will exceed the anticipated level. If so, it would follow that the relative desirability of various economic scenarios should have at least some effect on the choice.

(b) Some recent studies appear to show that the real rate of return (nominal rate less rate of inflation) decreases as the rate of inflation increases. However, this may be due not to any fundamental correlation but rather to the fact that, when the inflation rate is relatively close to its cyclical maximum, anticipated long-term inflation tends to be substantially below current actual inflation and longer term rates of return considered necessary by investors to compensate for such anticipated future rates of inflation are such as to depress current real interest rates substantially below their long-term average. It certainly seems reasonable to assume that if the long-term level of inflation in the future were to settle at a substantially higher level than has been experienced, say, over the past fifty years, then nominal interest rates would settle at a level which would produce real interest rates not substantially different from those experienced in the past. Real rates of return should also benefit from the gradually decreasing need for the expansionary policies that were necessary to accommodate the entry of the baby boom generation into the labour force and into the ranks of home owners and borrowers. A return to more conservative social, economic and political behaviour might be expected as this cohort approaches and passes age 40.

(c) The level of inflation assumed or implicit in the economic assumptions can be critical when attempts are made to compare different types of pension plans or when modifications in a particular plan are being considered. Also, it is important to recognize that while consistent assumptions are essential, they do not ensure acceptable conclusions regarding relative costs.

(i) The extent to which the required current service contribution rate is affected by the level of economic assumptions depends on the type of pension plan under consideration. For a pension plan of the career-average type, where the rate of interest is normally the sole economic assumption, a relatively high level of interest produces a relatively low cost. For a final-average-pay plan, such as the Public Service Superannuation Plan, where the effect of a relatively high assumed rate of interest tends to be offset by the effect of an accompanying relatively high level of assumed salary increases, the effect is considerably smaller. Finally, for a fully indexed final-average salary plan, such as the P.S.S.A. if it were combined with the existing provisions of the Supplementary Retirement Benefits Act, which is considered in parts (a) and (b) of Appendix 2, the level of assumed inflation tends to have a very slight effect on costs if its relationship to assumed interest rates and general increases in salaries remains approximately the same. In other words, in this case, estimated costs are governed largely by the differentials between the different economic assumptions.

(ii) Similar considerations apply to the value of accrued benefit liabilities. However, to the extent that benefits are funded by means of long term bonds, a relatively high assumed rate of interest will produce a relatively low value of the assets (if bonds are valued at the assumed rate). The net effect of assuming a relatively higher rate of interest would tend to appear as an improved financial status in the case of an unindexed plan but a deterioration in the case of an indexed plan (assuming consistency of assumptions).

(2) Effect of differentials between economic assumptions

Where applicable, the three relevant economic assumptions are:

p = rate of inflation

s = rate of increase in level of salaries

i = rate of return on investments

Although, strictly speaking, pension funding costs are affected by ratios of the type $\frac{1 + s}{1 + i}$ and $\frac{1 + p}{1 + i}$ for practical purposes the effect may be measured by the differentials $(i - s)$ and $(i - p)$.

The differential $(i - p)$ is commonly referred to as the real rate of return and may be thought of as reflecting the share of production allocated to capital. The real rate of return affects directly the funding cost of indexed pensions, and indirectly, as shown below, the funding cost of pensions based on final-average salary.

The cost of final-average salary plans is affected by the differential (i - s) which may be thought of as (i - p) - (s - p). The differential (s - p) is generally regarded as reflecting the rate of increase in productivity and may be referred to as the real rate of salary increases. Thus the cost of final-average salary plans may be said to be affected by the difference between the real rate of return and the real rate of salary increases.

(3) Effect of benefits beyond the terms of pension plans

As may be inferred from (1) and (2) above, when costs of different plans are being compared or amendments are being considered, it is important to bear in mind the level of the economic assumptions as well as the differentials between individual assumptions. However, there are considerations beyond these.

For a growing number of plans, in some cases as a result of collective bargaining, employers have in recent years adopted the practice of (a) making periodic ad hoc adjustments to pensions in payment to compensate for some or all of the purchasing power lost through inflation, and (b) increasing the benefits accrued to active members of flat-benefit or career-average type pension plans in order to keep earned pensions in a reasonable relationship to current rates of pay. In the absence of explicit commitment under the terms of the plan, future adjustments will not be included in the calculations of normal contribution rates and accrued pension liabilities.

It might be argued, especially when adjustments occur with regularity, that the employer has made a strong moral commitment to maintain pension values and that from an accounting point of view the costs are understated. It would be possible, of course, for the employer to make advance provision for future adjustments without contributing additional funds to the plan by setting up a special contingent liability in his balance sheet and including the additions to such contingent liability account with the current service contributions to the pension fund for purposes of assessing the total current service cost. Such practice might make for more valid comparison of the potential value of pensions under different plans and more equitable allocation of costs between different generations of shareholders, consumers and taxpayers. However, setting up a contingent liability in the employer's balance sheet might well be interpreted as converting a moral commitment into a relatively firm undertaking, in which case the additional benefits should be considered part of the formal plan and funded in the same manner as basic benefits. For practical purposes, of course, this would eliminate the employer's option of updating benefits from time to time without commitment regarding future adjustments.

B. Salary Increases

There are two main forces that tend to generate increases in salaries: First, a promotional force resulting from experience and training and increase in responsibility due to promotion; second, an economic force related, directly or indirectly, to such factors as collective bargaining, labour market conditions, inflation and general increases in productivity. Increases in salaries resulting from this second force are herein referred to as "general" increases.

Analysis of the data indicated that average promotional increases for males were somewhat lower than they had appeared in earlier studies. Accordingly, a new promotional salary scale was constructed for purposes of this report in respect of males.

With regard to general increases, the wide variations that have occurred in recent years as a result of varying economic and social pressures are indicative of the difficulty in predicting the level of future increases of this type, and in preceding valuations no explicit provision for such increases was made in determining the required contribution rate. (As mentioned in Section V, credits are made to the Account to cover increases in liabilities arising from general increases in pay, as they occur, to the extent that such increases are not provided for in the actuarial assumptions). For purposes of this valuation, in combination with the assumption of an interest rate of 6.5%, we have assumed a level rate of general increases in salaries of 5.5%.

The assumed rate of general increases of 5.5% may be thought of as being composed of a 3% inflation factor and a 2.5% factor* for increases in productivity. Further comments are made in the discussion of interest rates which follows.

Appendix 3 shows the promotional salary scales and salary scales incorporating both promotional and general increases.

C. Interest Rates

Until the quarter ending June 30, 1969, interest was credited to the Account on the last day of each quarter in the fiscal year at the rate of 1% of the balance to the credit of the Account on the last day of the preceding quarter. This is a rate equivalent to approximately 4% per annum which is the rate that has been assumed in preceding actuarial valuations.

The 1969 amendments to the Act made provision for crediting interest to the Account in excess of the rate used in the preceding actuarial valuation. The total rate at which interest is now credited changes every three months and is calculated as if the amounts not required for payment of benefits in each quarter pursuant to this Act and the Canadian Forces and R.C.M.P. Superannuation Acts had been invested on a basis similar to the one used for the Canada Pension Plan, i.e., in 20-year bonds having a yield equivalent to the average yield on Government of Canada bonds with 20 or more years to maturity outstanding at that time.

For the quarter ending December 31, 1977, the total rate of interest credit was 1.8372% which is equivalent to 7.55% per annum. The total annual rate of interest credit has increased to above 8% since that time and seems likely to continue to be above 6.5% for a long time, even if allowance is made for a drop in anticipated inflation

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* More precisely $\left(\frac{1.055}{1.03} - 1\right)$ or 2.427%

to substantially lower levels, given that rates of return on recent investments have been above 10%.

As stated earlier, in previous valuations an assumed interest rate of 4% was used, but the effect of using an assumed rate of return substantially lower than might be expected was largely offset by including no explicit provision for general increases in salaries.

For purposes of this valuation it was decided to use an assumed rate of interest of 6.5% which, as noted above, is expected to be exceeded by actual interest credits for a long time. The rate may be thought of as being composed of an inflation factor of 3% and a real rate of return of about 3.5%*, in the long term.

If the method of crediting interest described above is retained and past experience can serve as a guide, it is possible that the real rate of return may fall short of the assumed rate by perhaps three quarters of one percentage point in the long term. The effect of this, however, would be at least partially offset if the productivity factor implicit in the assumed salary scales turned out to be overstated by a similar margin, which is not at all improbable.

The real rate of return explicitly or implicitly assumed in recent actuarial valuations of private pension plans appears to fall usually between 3.5% and 4.5%, so that the assumption of a real rate of return of less than 3.5% at the present time would only add to the difficulties in comparing contribution rates with those of other plans.

D. Rates of termination for all reasons with less than five years of pensionable service

A return of contributions is the only benefit applicable in respect of a contributor who dies or otherwise ceases to be employed in the Public Service before he has to his credit five years of pensionable service. Thus, for valuation purposes, the rates of termination required for each of the first five years of pensionable service are the rates at which contributors cease to be employed for any reason. These are referred to hereinafter as "select rates of termination for all reasons".

With some exceptions, mainly among females, experience during the 1973-77 period indicated that termination rates for both male and female contributors were generally somewhat higher during the first year of service than those assumed for the preceding valuation, and during the later years were generally higher for male contributors but lower for female contributors. It was considered desirable therefore to use a revised set of termination rates for this valuation based on this more recent experience.

The rates used in this valuation are shown in Appendix 4.

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* The exact real rate of return would be equal to $\left(\frac{1.065}{1.03} - 1\right)$ or 3.398%.

E. Rates of termination for reasons other than age, age and service, disability or death after five or more years of pensionable service

and

Proportions of terminating contributors electing to take a deferred annuity or annual allowance

On the basis of the experience during the period 1973 -77, the termination rates were found to be higher for male contributors and lower for female contributors than those assumed for the preceding valuation. Revised rates based on this experience were used and are shown in Appendix 5.

As described in the "Summary of Benefits" in Appendix 1, contributors who terminate service for reasons other than age, age and service, disability or death and have five or more years of pensionable service have the option of electing a return of contributions, a deferred annuity to commence at age 60, or an annual allowance to commence immediately if the contributor's age is 50 or over, or at age 50 if the contributor's age is under 50. Contributors terminating after age 45 with at least 10 years of pensionable service must elect a deferred annuity or an annual allowance in respect to service after September 30, 1967.

The 1973-77 experience showed a decrease in the proportions electing to take a deferred annuity or annual allowance below age 45 but a continuation of the trend toward greater rates at the higher ages. Revised proportions based on this experience were used and are shown in Appendix 5.

The amount of an annual allowance is determined by the application of arbitrary* factors based on the age and length of service to the amount of the deferred annuity to which a terminating contributor is entitled. For the purposes of this valuation, annual allowances were assumed to be actuarially equivalent to deferred annuities.

F. Rates of retirement because of age or age and service

In this report, the expression "retirement because of age" applies to contributors entitled to an immediate annuity because of attainment of age 60 and completion of at least five years of pensionable service. Retirements with entitlement to an immediate annuity at ages 55 to 59 with at least 30 years of pensionable service are termed "retirement because of age and service".

As noted in previous reports there has been a marked trend toward higher rates of retirement at ages 60 to 65 which continued during the period 1973-77. During this period there was also a distinct increase in the rates of retirement because of age and service. The rates used were established on the basis of this most recent experience. They are shown in Appendix 6.

As might be expected, the age-retirement rates do not progress smoothly from age to age. There is a distinct heaping at age 60 (the earliest age at which an unreduced immediate annuity is available for "retirements because of age") and again at age 65 which may be regarded as the "normal retirement age" since employment in the Public Service after age 65 is contingent on special authorization from year to year. It was assumed as in preceding valuations that all active contributors who attain age 70 cease to be employed during the following year.

* See Note 8 in Appendix 1

G. Rates of retirement because of disability

Except at ages below 35 the experience during 1973-77 showed a continuation of the trend toward higher rates of retirement because of disability. New rates based on this most recent experience were adopted for this valuation and are shown in Appendix 7.

On the basis of data submitted on the contributors retired on account of disability whose basic annuities have been reduced as a result of their eligibility for CPP/QPP disability benefits, we have assumed that 50% of contributors retiring in the future on account of disability will have their basic annuities reduced for the same reason. The other 50% of such annuitants are assumed to have their basic annuities reduced at age 65 when the normal CPP/QPP retirement pensions become payable.

H. Mortality of contributors employed in the Public Service with five or more years of pensionable service

The number of actual deaths of contributors during 1973-77 was generally less than that expected on the basis used for purposes of the preceding valuation. It was, therefore, deemed appropriate to use mortality rates based on the most recent experience for this valuation.

The rates used are shown in Appendix 8.

I. Mortality of contributors entitled to an annuity or annual allowance for reasons other than disability

For the purposes of the three preceding valuations, the mortality rates deemed suitable to provide a margin for improvement in mortality over a considerable future period were, for males the a-1949 Table and for females the a-1949 Table projected in accordance with Projection Scale C assuming a year of birth 1910. The experience of the 1973-77 period indicated that these rates continue to provide a satisfactory margin and, accordingly, they were retained for the current valuation. The rates used and the relevant annuity values are shown in Appendix 9.

J. Mortality of contributors entitled to an annuity because of disability

The rates used in the four preceding valuations were select and ultimate rates of mortality developed from the experience of this class of former contributors during the 1948-57 period. The 1973-77 experience indicated that these rates continue to provide a reasonable margin for any improvements in mortality which may also be expected to affect disabled lives. Accordingly, these rates were retained for use in the current valuation.

The ultimate rates of mortality, applicable after the first three years following retirement, are shown in Appendices 10 and 11 for males and females, respectively. Rates of mortality for the first, second and third years following retirement are assumed to be the following multiples of the ultimate rates:

Males: 250%, 175% and 125%, respectively

Females: 190%, 145% and 115%, respectively

Annuity values based on these rates are also shown in Appendix 10 for males, and in Appendix 11 for females.

K. Widows

The rates of mortality used for valuing widows' allowances in the four preceding valuations were derived from the 1948-57 experience of widows under the Superannuation plan, and were designed to provide some margin for future improvement in mortality. On the basis of the 1973-77 experience, there remains very little margin in these rates, but it was considered satisfactory to retain the same rates for this valuation.

The rates of remarriage, varying by age and duration from widowhood, that were used for the four preceding valuations were developed from the experience during the period from January 1, 1940 to December 31, 1957, of widows awarded pensions from August 4, 1914 to December 31, 1957, under the Pension Act and previous Government administrative orders.

Experience among widows of contributors under the Superannuation plan in more recent years indicates that the number of remarriages of such widows is somewhat higher than expected on the basis of the above rates. However, it was considered that a moderate margin in the remarriage rates constituted a desirable offset to the vanishing margin in the mortality rates and, accordingly, the same remarriage rates were retained for use in the current valuation.

Sample remarriage and mortality rates, as well as annuity values based on the probabilities of payments ceasing as a result of death or remarriage are shown in Appendix 12A.

L. Widowers

As noted in Section I of this report, the widowers of deceased contributors who were employed in the Public Service on and after December 20, 1975, are entitled to annual allowances.

As at December 31, 1977, there were relatively few widowers entitled to benefits and therefore no usable experience under the Public Service Superannuation Plan on which to base remarriage and mortality rates for widowers of deceased contributors. The remarriage rates assumed for this valuation were the same as those used for purposes of the Canada Pension Plan. The mortality rates are those for male lives in the Life Tables 1970-72, Canada, as published by Statistics Canada.

Sample remarriage and mortality rates, as well as annuity values based on the probabilities of payments ceasing as a result of remarriage or death are shown in Appendix 12B.

M. Proportion of contributors married at death and Average ages of spouses corresponding to ages of contributors at death

Proportions of male contributors married at death were derived for the 1957 valuation from the 1948-57 experience for employed and retired contributors, separately. More recent experience indicates the proportion married at death was somewhat higher than that expected in accordance with the 1957 bases.

Average ages of widows corresponding to ages of contributors at death were derived for the 1957 valuation from the 1948-57 experience for employed and retired contributors combined. According to the more recent experience, the differentials between the ages of widows and the ages of deceased contributors at date of death have decreased slightly.

Because of the offsetting effects of indicated trends in the two factors under consideration, it was considered appropriate to continue the use of the 1957 bases for the current valuation. Values are shown in Appendix 13 for quinquennial ages of contributors at death.

In view of the lack of data on the proportion of female contributors and annuitants married at death, arbitrary rates were chosen. The average ages of widowers corresponding to ages of female contributors and annuitants at death were based on the corresponding table for male contributors. The proportions and average ages used in the valuation are shown in Appendix 13 to this report.

N. Children and Students

In the current as well as preceding valuations, mortality was ignored in determining the value of allowances payable to children and students, because such allowances are not payable after the 25th birthday and the effect of mortality at the relevant ages would have been negligible.

As payment of allowances to a child between ages 18 and 25 is conditional on the child being in full-time attendance at school, we have determined the probabilities of a child at any age continuing to be eligible during the next year of age using data on the children who have received allowances at any time after their 18th birthday. These probabilities have been applied in calculating the present value of allowances to children receiving them at December 31, 1977, and they are shown in Appendix 13.

O. Proportion of contributors with salaries below "Year's Maximum Pensionable Earnings" (as defined in Canada Pension Plan)

and

Ratios of average salary to "Year's Maximum Pensionable Earnings" for contributors with salaries below that maximum

As described in Appendix 1, the basic annuity of a retired contributor reaching age 65 or becoming entitled to a disability pension under the Canada or Quebec Pension Plan is reduced by reason of the co-ordination of the Public Service Superannuation Plan with the Canada and Quebec Pension Plans. The amount of the reduction is related to the number of years of pensionable service since 1965 or since becoming a contributor, if later, and the lesser of the contributor's average salary used in determining his basic annuity or the "Average Maximum Pensionable Earnings" (see Note 4 in Appendix 1). Similarly, a contributor's contributions to the Superannuation plan are reduced by the amount of his contributions to the Canada or Quebec Pension Plans. The contributions to these latter plans are subject to an annual maximum based on the "Year's Maximum Pensionable Earnings" (Y.M.P.E.) for these plans.

In valuing the liability for future benefits and employer costs in respect of current service, the proportions of contributors by age with salaries below the Y.M.P.E. and the ratios of the average salary of such contributors to the Y.M.P.E. are required. As at December 31, 1977, the Y.M.P.E. was $9,300. However, pursuant to recent amendments to the Canada and Quebec Pension Plans the Y.M.P.E. is scheduled to be increased by 12 1/2% per annum until it reaches the industrial composite annual average of wages and salaries. In view of this, it was deemed more appropriate to develop the required proportions as if the Y.M.P.E. at the date of valuation had been $13,400 (the approximate value of the industrial composite average at December 31, 1977) and to use this value for the Y.M.P.E. (increasing at the assumed rate of general increase in salaries of 5.5% p.a.) when determining the effect of the reduction in P.S.S.A. benefits (resulting from integration with CPP/QPP benefits) on the liabilities and the employer's current service contributions.

The proportions and ratios used in this valuation are shown in Appendix 14.

IV. Funding Method

The funding method used for purposes of the preceding report was retained. It is known as the Unit Credit or Accrued Benefit cost method and contemplates contributions in any year sufficient to fund all future benefits in respect of service during that year. The liabilities in respect of active contributors are taken as the present value of all future benefits in respect of pensionable service to the date of valuation.

V. Rates of Contribution and Required Credits to Account

Using the assumptions described in section III of this report, and the distribution of active contributors as at December 31, 1977, the total rate required from contributors and the Government combined to provide all benefits in respect of current service was calculated to be 11.9% of salary.

After making allowance for co-ordination with contributions payable to the Canada/Quebec Pension Plan, contributions from contributors to the Account were calculated to be equal to approximately 5.4% of salary. It is apparent that these contributions together with matching Government credits to the Account leave a deficiency of 1.1% of salary. If the Act is not amended to allow for credits to the Account to be made at the appropriate level, estimated at approximately 1.2 times the amount of employee contributions, a deficit of the order of 400 million dollars may be expected to accumulate by December 31, 1982, the date of the next quinquennial actuarial examination of the Account.

The rates of government credits required, as stated above, are higher by about 0.7% than they would be on the assumptions used for purposes of the preceding report. The difference is largely accounted for by increases of 0.8% and 0.3% attributable to changes in retirement rates and economic assumptions, respectively, and a decrease of 0.4% attributable to changes in the male salary scale.

As noted elsewhere, in addition to the regular "matching credits" referred to above, the Government is required to credit to the Account following authorization of any salary increase applicable to at least one per cent of the contributors employed in the Public Service, an amount representing the net increase in liabilities resulting from that salary increase. The amount of this special credit is estimated as 1.4 times the excess, if any, of the total amount of an authorized increase in salaries over 5.5% p.a. of total salaries of contributors receiving such increase.

VI. Valuation Balance Sheet and Observations

The results of the valuation based on the assumptions and funding method described in Sections III and IV, respectively, are summarized and the financial status of the Account as at December 31, 1977, is shown in the following balance sheet.

Assets

		(millions)
Balance of Account (Par Value)*		$8,661.8
Government matching credits outstanding December 31, 1977, in respect of past contributions by contributors		199.4
Government credits outstanding December 31, 1977, in respect of past general increases in salaries		217.2
Present value of future instalments of past service contributions and matching credits by the Government		
Employed contributors	$123.3	
Retired contributors	25.0	148.3
Total Assets		$9,226.7
Deficit		61.5
		$9,288.2

Liabilities

Present value of prospective benefits to and in respect of employed contributors		$6,591.5
Present value of benefits to persons entitled to an annuity or annual allowance		
Retired contributors on pension	$2,348.7	
Deferred annuities	59.1	
Spouses	284.7	
Children and Students	4.2	2,696.7
Total Liabilities		$9,288.2

* The value of the Account as at December 31, 1977, determined by discounting the notional investments at the assumed valuation interest rate of 6.5% was $9,827.7 million. It was decided not to use such value, so as not to capitalize interest earnings in excess of the assumed rate without compensating provision for general salary increases in excess of the assumed rate of 5.5% in the short term.

Deferred charges totalling $859.9 million were in the process of amortization and would be considered an unfunded liability, if they were not included in the balance of the Account.

The foregoing balance sheet indicates a deficit of $61.5 million. The major actuarial gain and loss items combining to produce this deficit were calculated to be as follows:

	($ millions) Gains	Losses
1. Deviation of actual increases in general level of salaries from those accounted for by special credits of $1,579.2 million to the Account		865
2. Deviation of actual from expected promotional salary increases	101	
3. Deviation of actual from expected retirements		79
4. Deficiencies in contributions and credits in respect of current service		147
5. Apparent overstatement in 1972 liabilities due to overstatement in basic data	176	
6. Effect of 1975 amendments		70
7. Adoption of new economic assumptions		
(a) Employed contributors	382	
(b) Persons entitled to annuity or annual allowance	558	
8. Adoption of new retirement rates		406
9. Adoption of new promotional salary scale for males	182	
10. Other changes in actuarial assumptions		65
11. Residual net gain	171.5	
	1,570.5	1,632

VII. Conclusion

1. The total contribution rate required from contributors and the employer combined to provide all benefits in respect of current service was estimated at 11.9% of salary. Contributions and credits at that level make provision for future increases in the general level of salaries at the rate of 5.5% per annum. It is estimated that the additional liabilities arising from increases in salary levels in excess of that rate may be provided for by means of special Government credits to the Account equal to 1.4 times the total amount of any authorized increase in salaries in excess of 5.5% in any one year.

2. The estimated deficit in the Account as at December 31, 1977, was $61.5 million.

3. If the combined employer-employee contribution rate remains unchanged at an estimated 10.8% of salary, a deficit of the order of $400 million may be expected to accumulate by December 31, 1982, the next quinquennial actuarial examination of the Account. On the other hand, if it were desired to raise Government credits to the Account to a level which would avoid the recurring accumulation of such deficits, it is estimated that this might be accomplished by making Government credits at the rate of 1.2 times the amount of contributions received from contributors.

4. This report on the Superannuation Account makes no allowance for contributions or benefits related to the Supplementary Retirement Benefits Act. These are discussed in Appendix 2.

We wish to take this opportunity of acknowledging the co-operation and able assistance of the Superannuation Division and the Personnel Data Systems Division of the Department of Supply and Services.

Respectfully submitted,

Walter Riese

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December 19, 1979.

VIII Index of Appendices

APPENDIX 1

Summary of Public Service Superannuation Plan

A. Coverage

The Public Service Superannuation Act requires contributions from and grants benefits to every full-time employee in the Public Service who has attained age 18 and is in receipt of an annual salary of at least $900, subject to a few exceptions.

The term Public Service as used in the Act includes all positions in any department or portion of the executive government of Canada, of the Senate and House of Commons, the Library of Parliament and any board, commission or corporation listed in a Schedule to the Act.

Persons engaged as sessional employees, postmasters or assistant postmasters in revenue post offices and some others, may be designated as contributors by the President of the Treasury Board either individually or as members of a class.

The main groups of persons employed in the Public Service to which the Act does not apply are part-time employees, persons engaged locally outside Canada and employees of some Crown Corporations covered by separate pension plans.

Two main groups of persons are entitled to receive benefits under the Act, namely:

(i) former contributors who become entitled to lump sum payments, immediate or deferred annuities or immediate or deferred annual allowances payable out of the Account;

and

(ii) surviving spouses and children who are entitled to annual allowances payable out of the Account by reason of the death of a contributor while employed in the Public Service or while entitled to an annuity or allowance payable from the Account.

Benefits may also be payable to the estates of deceased contributors or former contributors in certain cases where there are no eligible spouses or children entitled to receive annual allowances.

B. Contributions and Credits to the Account

1. By Contributor

(a) Current Service

The rate of contributions for contributors is 6.5% of salary reduced in each case by the amount that the contributor would be required to contribute under the Canada Pension Plan (C.P.P.) or the Quebec Pension Plan (Q.P.P.) in respect of that salary if that salary, expressed in terms of annual rate, were the total amount of his income for the year from pensionable employment as defined in that Act and that Act applied to his employment. (For example, in 1979, the C.P.P./Q.P.P. required contributions of 1.8% of that portion of annual salary between $1,100 and $11,700 as earned).

Contributions cease after a contributor has to his credit 35 years of pensionable service (less the number of years of service upon which any pension benefit payable to the contributor out of the Consolidated Revenue Fund, or out of any account or fund in the Consolidated Revenue Fund other than the Superannuation Account, or out of a pension fund pursuant to which contributions have been paid out of the Consolidated Revenue Fund in respect of employees engaged locally outside Canada, is based).

(b) Prior Service

A contributor may count as pensionable service certain types of prior service* for which he elects to contribute. In general, if an election for a period of pensionable service is made by an employee within one year after he last became a contributor under the Act, the amount that he is required to contribute is equal to the total annual contributions that would have been made during that period of service at the rate of contribution in force for current service at that time applied to the salary authorized to be paid to the contributor at the most recent date of becoming a contributor, together with interest. The amount of the interest is equal to simple interest at 4% per annum from the middle of each fiscal year in which contributions would have been made, if the contributor had been making such contributions during the period for which he elected to pay, until the date of the election.

For some major types of prior pensionable service for which a contributor elects to pay, the amount of contribution required is double that determined by this general rule. Included in this category are:

(i) any period of service in pensionable employment, prior to becoming employed in the Public Service, to the credit of the contributor in a superannuation or pension plan, approved by the President of the Treasury Board for purposes of the Act, which had been established for the benefit of persons engaged in that employment, and

* See Note 1 in Section D of this Appendix

(ii) any period of active service in the forces in World War II, where the contributor was not employed in the Public Service immediately prior to enlistment in the forces.

If a contributor makes an election for a period of pensionable prior service more than one year after becoming a contributor the amount of contribution that he is required to contribute is based on his salary at date of election.

Any contributor electing to contribute for pensionable prior service must be medically examined as prescribed by regulation, unless he was employed in the Public Service, or was a member of the Canadian Forces or R.C.M.P. for a period of at least five years immediately prior to last becoming a contributor. If a contributor makes his election more than one year after last becoming a contributor he must pass the medical examination for the election to be valid. For other elections, if the contributor fails to pass the medical examination when required, benefits related to such pensionable prior service are limited to a return of contributions, unless the contributor continues to be employed in the Public Service for a further period of not less than five years after the date of the examination or is again medically examined and passes the examination.

The total amount of contributions for prior service determined in accordance with the above rules may be paid in a lump sum at date of election or by monthly instalments. If a contributor, at date of election for a period of prior service, is under age 45, the monthly instalment period may not extend beyond his 65th birthday; if the contributor is age 45 or over, the monthly instalment period may not be longer than 20 years. Monthly instalments are computed in accordance with regulations on the basis of the Canadian Life Tables No. 2 (1941) Males or Females, as the case may be, and interest at 4% per annum.

2. By Employer

The Government and the Public Service Corporations, as employers credit the Account with amounts matching the contributions of their respective employees to the Account. In addition, the Government credits the Account with such amounts as, in the opinion of the Minister of Finance, are necessary to provide for the increase in cost of the benefits payable under the Act as a result of any salary increase applicable to at least one percent of the contributors or are required to meet the cost of benefits payable under the Act as shown by the most recent actuarial report on the account.

The "matching credits" by the Government are made in the fiscal year following the year in which the contributions were made by its employees. The technique for financing the other two types of employer contributions is to credit to the Account the full amount estimated to be required in the fiscal year that the salary increase is authorized or the actuarial report is laid before Parliament and to charge such amounts to the Consolidated Revenue Fund in five equal annual instalments beginning in such fiscal year.

In its role as custodian of the Account, the Government credits the Account with amounts representing interest on the balance in the Account from time to time calculated at the interest rate assumed in the preceding actuarial valuation and at such supplementary rate as may be provided by regulation. (See Section III C of this report for further details). However, the Minister may apply such supplementary interest to reduce the instalments being charged to the Consolidated Revenue Fund in respect of increases in costs due to salary increases and in respect of deficiencies shown in statutory actuarial reports.

C. Summary of Benefits*

(1) Contributors with less than five years of pensionable service (Note 1)

With a few exceptions, the only benefit to which a contributor in this category is entitled upon termination of service is a "return of contributions" (Note 2).

(2) Contributors with five or more years of pensionable service

(a) Contributors employed in Public Service at date contingency occurs

Contingency	Benefit
Retirement because of age or age and service (Note 3)	Immediate annuity (Note 4)
Retirement because of disability (Note 3)	At option of contributor (Note 10): A. immediate annuity (Note 5), or B. cash termination allowance (Note 6) or return of contributions, whichever is greater
Termination for reasons other than age, age and service, disability, misconduct or death (Note 3)	At option of contributor (Note 10): A. return of contributions, B. deferred annuity (Note 7), C. annual allowance payable immediately, if he is age 50 or over, and otherwise upon attaining age 50 (Note 8)
Dismissal because of misconduct	A. return of contributions, or B. with the consent of the Treasury Board, the whole or any part specified by the Treasury Board of any benefit to which the contributor would have been entitled had he ceased to be employed for a reason other than misconduct (Note 9)
Death leaving no surviving spouse or eligible children	Return of contributions or five times the annuity to which the contributor would have been entitled at the time of his death, whichever is greater
Death leaving surviving spouse and/or eligible children	Annual allowance (Notes 11 and 12)

* The explanatory notes referred to in this summary are given in Section D of this Appendix. Supplementary benefits to offset loss of purchasing power are provided under another Act and are described in Appendix 2.

(b) Contributors who have ceased to be employed in the Public Service and are entitled to annuities or annual allowances

Contingency	Benefit
Disability before age 60 while entitled to a deferred annuity or an annual allowance	Immediate annuity (Note 5)
Death leaving no surviving spouse or eligible children	Minimum benefit (Note 12)
Death leaving surviving spouse and/or eligible children	Annual allowance (Notes 11 and 12)

D. Explanatory Notes

Note 1

The amount of any annuity or allowance to which a contributor or his surviving spouse or children may become entitled under the Act and in some cases the reduction factor used in determining the amount of an annual allowance payable to a contributor depend on the number of years of pensionable service to the credit of the contributor at the date he ceases to be employed in the Public Service.

"Pensionable Service" of a contributor is defined in the Act and includes in general terms any period of service in the Public Service for which he has been required to contribute or has elected to contribute, if eligible to do so, and such other types of service for which he has elected to make special contributions as required by the terms of the Act. The periods of service in the Public Service or in other employment for which he may be eligible to elect to contribute include the following:

(a) a period of service before becoming a contributor under the Act during which he was employed in the Public Service and was receiving a salary,

(b) a period of service in respect of which he has received any amount by way of a return of contributions or other lump sum payment under the Act,

(c) a period of active service in the forces during World War II or with the Korean Special Force prior to becoming a member of the Public Service,

(d) a period of pensionable full-time service with the Canadian Forces, the Royal Canadian Mounted Police, or an employer with whom a reciprocal transfer agreement has been completed,

(e) a period of service in civilian war service of a kind specified by regulation,

(f) a period of service in pensionable employment, immediately prior to becoming employed in the Public Service, subject to a pension plan approved by the President of the Treasury Board for this purpose.

Note 2

"Return of Contributions" means the payment of an amount equal to the total current and prior service contributions paid by the contributor into the Account or paid into any other superannuation account or pension fund and transferred to the Account plus interest credited to December 31st of the year immediately preceding the year the contributor ceased to be employed in the Public Service. Interest at the rate of 4% per annum is credited each December 31st (beginning in 1974) on the accumulated contributions with interest as at the prior December 31st.

Note 3

Employment of contributors may normally be terminated by reason of age at about age 65. In this summary, however, "retirement because of age or age and service" means ceasing to be employed in the Public Service, for any reason other than misconduct or death, at age 60 or over, or at ages 55 to 59 with pensionable service of 30 years or more. It follows that "retirement because of disability" refers only to those retirements for that reason where the contributor would not be entitled to the same benefits by reason of age or age and service and that "termination for reasons other than age, age and service, disability, misconduct or death" also refers only to terminations before age 55 or at ages 55 to 59 with less than 30 years of pensionable service.

Note 4

"Immediate annuity" means an annuity that becomes payable to a contributor immediately upon his becoming entitled thereto. The annual amount of "basic annuity" is equal to 2% of average annual salary in respect of any selected six-year period of pensionable service multiplied by the number of years of pensionable service up to a maximum of 35. The six-year period may consist of consecutive periods of pensionable service totalling six years. If a contributor has less than six years of pensionable service, the average annual salary is based on salary in respect of his total pensionable service. Any annuity or annual allowance is ordinarily payable in equal monthly instalments in arrears until the end of the month in which the person receiving it dies or ceases to be entitled thereto.

When a contributor entitled to an annuity or annual allowance has reached age 65 or has become entitled to a disability pension under the terms of the Canada Pension Plan or Quebec Pension Plan, the annuity or annual allowance is reduced by an amount equal to 0.7% of the average salary multiplied by the number of years of pensionable service after 1965 that are counted in the calculation of the basic annuity, provided that the average salary used in this calculation will have a maximum value of the "Average Maximum Pensionable Earnings". The latter amount is the average of the "Year's Maximum Pensionable Earnings" as defined in the Canada Pension Plan for the year in which the contributor ceased to be employed in the Public Service and for each of the two preceding years.

Note 5

When a contributor under age 60 and entitled to an annuity in respect of a disability is certified in accordance with regulations to have regained his health or to be capable of performing the duties of his former position in the Public Service or any other position in the Public Service commensurate with his qualifications he ceases to be entitled to that annuity and becomes entitled to a deferred annuity.

When a contributor entitled to a deferred annuity or annual allowance becomes disabled before age 60, he ceases to be entitled to that deferred annuity or annual allowance and becomes entitled to an immediate annuity adjusted in accordance with regulations to take into account the amount of any annual allowance which he may have received prior to becoming disabled.

Note 6

"Cash termination allowance" means an amount equal to one month's salary for each year of pensionable service (in the usual case at the rate of salary authorized to be paid to the contributor at the time that he ceases to be employed in the Public Service) less an amount equal to the reduction in contributions paid to the Account because of co-ordination with the Canada Pension Plan and the Quebec Pension Plan.

Note 7

"Deferred annuity" means an annuity that becomes payable to a former contributor when he reaches age 60. The annual amount of the annuity is computed as described in Note 4.

Note 8

The amount of the annual allowance is equal to the amount of the deferred annuity to which the contributor would have been entitled, if he had elected to receive a deferred annuity, reduced by the product obtained by multiplying 5% of that amount by a factor varying with age and length of pensionable service at retirement.

For a contributor age 50 or more with not less than 25 years of pensionable service to his credit, the factor is the greater of fifty-five minus his age and thirty minus his number of years of pensionable service.

For a contributor age 55 or more who has been employed in the Public Service on a full-time basis for a period or periods totalling at least ten years and who does not retire voluntarily the factor is thirty minus the number of years of pensionable service. In any such case the whole or part of the reduction calculated using this factor may be waived by the Treasury Board.

For all other cases the factor is sixty minus the contributor's age.

In all cases, the factor is determined by expressing age or length of service to the nearest one-tenth of a year.

Note 9

In the case of dismissal because of misconduct, the capitalized value of any annuity or annual allowance granted by the Treasury Board computed in accordance with regulations on the basis of the a(f) and a(m) Ultimate Tables of mortality and interest at 4% per annum may not be less than the "return of contributions" as defined in Note 2.

Note 10

If on termination of employment a contributor has attained age 45 and has to his credit 10 or more years of pensionable service, his right to select a "return of contributions" or a "cash termination allowance" benefit is limited to the period of pensionable service prior to October 1, 1967. With respect to the service on and after that date, it is mandatory that he receive an annuity or annual allowance.

Note 11

"Annual allowance" to the surviving spouse of an active contributor or a former contributor entitled to receive an annuity or annual allowance means one-half of the annual amount of "basic annuity" computed as described in Note 4. This is termed the "basic allowance".

No allowance is payable to the widower of a female contributor unless the contributor was employed in the Public Service and had 35 years of pensionable service or was required to contribute to the Superannuation Account on or after December 20, 1975.

If the age of the contributor exceeds that of his surviving spouse by 20 or more years, the spouse allowance is reduced. If a contributor dies within one year after his marriage, no allowance is payable to the surviving spouse if the Treasury Board is not satisfied that the contributor was at the time of his marriage in such a condition of health as to justify him in having an expectation of surviving for at least one year thereafter. Also if a contributor marries after having become entitled to an annuity or annual allowance his surviving spouse is not entitled to any annual allowance unless, after his marriage, he became or continued to be a contributor.

If a surviving spouse remarries, the allowance is either suspended during the period of remarriage or forfeited, if the spouse requests and receives a return of contributions less all payments made to the contributor, surviving spouse and children. Such request can only be made during the period of remarriage if there is no child of the contributor entitled to an annual allowance under the Act.

The allowance to a surviving spouse which has been suspended upon remarriage will be resumed in the event of the dissolution or annulment of that marriage, or the death of the new spouse.

"Annual allowance" to each child of a deceased contributor means one-fifth of the "basic allowance" described above, or if there is no living spouse, two-fifths of the basic allowance. The allowance is payable to any child under age 18 until he reaches his 18th birthday, and to any child 18 years or older until he reaches his 25th birthday provided he remains unmarried and has been in full-time attendance at school or university substantially without interruption since his 18th birthday or the death of the contributor whichever occurred later. The total amount of allowance payable to the eligible children of a deceased contributor when there are more than four may not exceed that which would be payable if there were only four.

A child born to the widow of a contributor is not entitled to an annual allowance unless the child was conceived before the death of the contributor. Also a child who was born or adopted by a contributor or who became the stepchild of a contributor after the contributor ceased to be employed in the Public Service is not entitled to an annual allowance unless, in the case of a child born to a contributor, the child was conceived before the contributor ceased to be employed.

Note 12

If upon the death of a contributor there is no person to whom an allowance provided under the terms of the Act may be paid, or if the persons to whom such allowances may be paid die or cease to be entitled thereto and no other amount may be paid to them, there is paid to the estate of the contributor:

(1) if the contributor was not employed in the Public Service on or after December 20, 1975, any amount by which the amount of return of contributions exceeds the aggregate of all amounts paid to those persons and to the contributor,

(2) if the contributor was employed in the Public Service on or after December 20, 1975, any amount by which the greater of the amount of the return of contributions, and an amount equal to five times the immediate annuity to which the contributor was or would have been entitled at the time of his death exceeds the aggregate of all amounts paid to those persons and to the contributor.

APPENDIX 2

Supplementary Retirement Benefits

In 1970, the Supplementary Retirement Benefits Act (SRBA) was passed to provide supplementary benefits related to increases in the cost of living for persons in receipt of pensions payable out of the Consolidated Revenue Fund. This Act applies to former contributors to the Superannuation Account and their surviving spouses and children who are entitled to annuities or annual allowances.

The supplementary benefit is calculated by multiplying the amount of the annuity or annual allowance to which the person is entitled from the Superannuation Account by the ratio of the Benefit Index for the year of payment to the Benefit Index for the year in which the person to whom or in respect of whose service the pension is payable ceased to hold office, and subtracting the amount of the annuity or annual allowance. The Benefit Index for the years prior to 1971 is shown in a Schedule in the Act. The Benefit Index for any year after 1970 is equal to the Benefit Index for the preceding year multiplied by the average of the Consumer Price Index for Canada for the twelve-month period ending on September 30 of that preceding year and divided by the average for a corresponding period one year earlier. Prior to 1973, the increase in the Benefit Index was limited to a maximum of 2% in any year. An amendment to the Supplementary Retirement Benefits Act in 1973 removed that limit and provided that the increase payable in January 1974 would take into account increases in the cost of living above the 2% ceiling since 1970.

Under the terms of the original Act of 1970, the supplementary benefits were payable to all former contributors in receipt of annuities or annual allowances who had attained the age of 60, or, if less than that age, were disabled, and to all spouses and children in receipt of annual allowances. The amendments effective January 1, 1973 provided for the payment of benefits to all former contributors in receipt of annuities or annual allowances except in cases of dismissal for misconduct.

The Public Service Superannuation Act was amended in 1970, by the addition of Part III, to require that contributors pay 0.5% of their salary to the Supplementary Retirement Benefits Account in addition to their contributions to the Superannuation Account. By a further amendment in 1973, provision was made for an increase in this contribution rate from 0.5% to 1.0%, commencing January 1, 1977. Such contributions are payable until the contributor retires. The government makes credits to the Account equal to the contributions of the employees.

Interest is also credited to the Supplementary Retirement Benefits Account at the end of each quarter. The amount of the interest is calculated monthly on the minimum balance at a rate of interest representative of the yield on outstanding Government of Canada bonds having a term to maturity of 5 years, less 1/8 of 1%.

Prior to January 1, 1974, the Supplementary Retirement Benefits Act provided that all supplementary benefits would be charged to the Account. Since that date, those benefits paid in respect of a former contributor are charged to the Account only until their accumulated total equals the aggregate of all amounts credited to that Account in respect of that person, including interest. Supplementary benefits paid in excess of that aggregate are then charged to the Consolidated Revenue Fund. The Act also provides for a return of contributions paid by a contributor to the Supplementary Retirement Benefits Account, to the extent that such contributions exceed any benefit that has been or may be paid to him or his spouse or children from that account.

Contributions and other credits to the Account, and supplementary benefits paid to former contributors and their surviving spouses and children receiving basic benefits under the Public Service Superannuation Act, and other charges to the Account during the fiscal years, 1976-77 and 1977-78 are shown below. (The liabilities of the Superannuation Account are not affected by these transactions).

Public Service Supplementary Retirement Benefits

Credits to the S.R.B. Account	1976-77	1977-78
Contributions from employees	$ 26,661,150	$ 49,237,432
Government credits	26,661,150	49,237,432
Interest	9,086,628	15,043,460
Transfers in	550,096	45,901
	$ 62,959,024	$113,564,225
Charges to the S.R.B. Account		
Supplementary Benefits	$ 5,292,724	$ 5,256,041
Refunds on withdrawal	2,423,262	3,009,220
Transfers out	96,053	125,169
	$ 7,812,039	$ 8,390,430
Balance in Account (end of year)	$148,840,981	$254,014,776
Charges to Consolidated Revenue Fund		
Supplementary Benefits	$ 83,612,893	$107,950,716

Under the partially funded system of financing supplementary retirement benefits as it existed on December 31, 1977, a substantial balance will be accumulated in the Supplementary Retirement Benefits Account. However, on the basis of the assumptions used for purposes of Section V of this report on the Superannuation Account and (for consistency with other assumptions) an assumed rate of increase in the Consumer Price Index of 3% per annum, it has been estimated that the supplementary benefits will likely always remain a direct charge on the Consolidated Revenue Fund, unless the total of normal contributions and credits to the Supplementary Retirement Benefits Account were increased from 2.0% to about 4.0% of payroll and provision were made to handle deviations of actual from expected experience. Even if normal contributions and credits were raised to this level, some supplementary benefits related to periods of service when contributions were below this level would remain a direct charge on the Consolidated Revenue Fund for a long time. In any event, if principles of actuarial funding were to be applied to the Supplementary Retirement Benefits, it would be desirable to finance all pension benefits in respect of Superannuation Account contributors through one account; this could be expected to result in greater stability and avoid the situation where one account would have a surplus while the other had a deficit.

Other methods of financing supplementary retirement benefits are presented below.

(a) Required Contributions and Credits to the Superannuation Account, if benefits pursuant to the Supplementary Retirement Benefits Act as it existed in 1977 were considered superannuation benefits

Using the above-noted assumptions, and methods analogous to those used for purposes of Section V of this report, the total required from the contributors and the Government combined to fund superannuation benefits in respect of current service, increasing in accordance with the Consumer Price Index, was calculated to be 15.9% of payroll. After making allowance for co-ordination with contributions payable to the Canada/Quebec Pension Plan, contributions from employees, including 1% contributions to the Supplementary Retirement Benefits Account, are calculated to be equivalent to 6.4% of salary. It follows that credits on behalf of the Government in respect of the combined benefits would have to be equivalent to about 9.5% of salary, or 1.48 times the contributions received from employees.

In addition, a procedure analogous to the existing procedure could be adopted under which special credits would be made in respect of liabilities arising out of (i) general salary increases in excess of the assumed 5.5% per annum, and (ii) increases to annuities and allowances to and in respect of former contributors in excess of the assumed 3%, either or both of which could be offset by interest earnings on the Account in excess of the assumed 6.5%. With such a procedure, the only gains and losses attributable to variation of experience from the basic economic assumptions that would emerge at periodic actuarial examinations are (i) gains from general salary increases and increases to annuities and allowances below the assumed rates, and (ii) losses and unused gains from interest earnings below and above the assumed rate, respectively. However, it would seem desirable to adopt the more common practice of letting all actuarial gains and losses accumulate until the following actuarial examination, particularly if periodic examinations were made triennially instead of quinquennially.

The following table shows the individual as well as combined effect of sample variations of experience from the economic assumptions in any one year in terms of equivalent additional required percent of payroll.

		Required Additional % of Payroll				
			Combinations			
	Actual General Salary Increase	Indiv. Var'n.	(1)(3)(6)	(2)(4)(7)	(2)(4)(6)	(2)(5)(6)
(1)	7%	+2.4	+2.4			
(2)	8%	+4.0		+4.0	+4.0	+4.0
	Actual C.P.I. Increase					
(3)	5%	+2.3	+2.3			
(4)	6%	+3.5		+3.5	+3.5	
(5)	8%	+5.8				+5.8
	Actual Interest Earned*					
(6)	8%	-4.5	-4.5		-4.5	-4.5
(7)	9%	-7.6		-7.6		
	Net Effect		+0.2	-0.1	+3.0	+5.3

* Interest is assumed to be earned on assets equal to total actuarial liabilities. To the extent that interest in excess of the assumed valuation rate is not earned on any unfunded liabilities, the mitigating effect of "inflationary" interest earnings would be less.

(b) Balance Sheet, if benefits pursuant to the Supplementary Retirement Benefits Act as it existed in 1977 were considered superannuation benefits

	($ millions)
Assets	
Balance of Superannuation Account and share of Superannuation contributors in Supplementary Retirement Benefits Account	8,882.4
Credits from Government outstanding at December 31, 1977 and made in 1978	416.6
Present value of future instalments from contributors and related Government Credits in respect of prior service	185.3
Total Assets	9,484.3
Deficit	3,883.5
	13,367.8
Liabilities	
Present value of prospective benefits to and in respect of active contributors	8,776.7
Present value of future benefits to persons entitled to an annuity or annual allowance	4,591.1
Total Liabilities	13,367.8

This balance sheet is based on the same assumptions as were used for purposes of calculating the required contributions and credits in (a) above. It differs from the balance sheet in Section VI of this report to the extent that (i) the assets include a share of the Supplementary Retirement Benefits Account and future Government credits related to instalment payments based on a factor of 1.5 times the amount from contributors, (ii) the value of prospective benefits to and in respect of active contributors includes provision for increases to annuities and allowances in accordance with increases in the Consumer Price Index, and (iii) the value of prospective benefits to persons entitled to an annuity or annual allowance includes the value of all supplementary benefits based on the Benefit Index for 1977 and makes provision for continued increases in accordance with increases in the Consumer Price Index.

(c) Proposal to use interest earned on the "pensioner equity" in excess of some arbitrary rate for financing Supplementary Retirement Benefits

It has been suggested from time to time that adjustments to pensions in payment, instead of being guaranteed, might be made dependent on certain earmarked funds, such funds at least partly being derived from "inflationary" interest earnings on the pensioner equity. For example, if earnings used for this purpose were to be earnings in excess of the assumed "real" rate of interest (i.e. approximately 6.5 - 3.5 = 3.0% for purposes of this report), then for practical purposes the total required from contributors and the Government combined, in respect of current service, would be the same as in (a) above and the valuation balance sheet would be the same as in (b) above. However, if future adjustments were not linked automatically to an index then, in contrast to (a) above, there would be no automatic requirement for additional funds if the actual rate of inflation exceeded the assumed rate.

If any special contributions, currently being credited to the Supplementary Retirement Benefits Account were to be used for financing additional adjustments to pensions currently in payment, credits on behalf of the Government would have to be equivalent to 10.5% of pay (15.9% less about 5.4% from contributors) in addition to any special employer contributions earmarked for supplementary benefits. Needless to say, if the rate above which interest earnings were to be available for adjustments were set somewhat higher, then required contributions would be somewhat lower; however this might be at least partly offset, if special contributions were increased to compensate for a lower rate of interest earnings made available for supplementary benefits.

In the above arrangement while total employee contributions would remain unchanged at about 6.4% of salary, total Government credits would be 11.5% (including the 1% credits to the SRB Account). This is higher by 2% than the rate of Government credits required under (a) above and, if the economic assumptions were realized, the extra 2% of payroll would not be required.

Under current conditions, the above rates of contribution and Government credits would support adjustments to pensions in payment of about 6.8% (5.0% financed by interest earnings in excess to the assumed rate of 3.5%, and 1.8% financed by the earmarked SRB contributions of 2% of payroll).

(d) Required rates of Government Credits and Valuation Balance Sheet, if Supplementary Retirement Benefits payable* as at December 31, 1977 were considered superannuation benefits but no future increases were assumed to be guaranteed

If in this scenario it is assumed that the existing contributions and credits to the SRB Account are applied to provide supplementary benefits, then the required rate of Government credits to provide superannuation benefits in respect of current service would be 6.5% of salary, as in Section V of this report.

As at December 31, 1977, contributions and credits to the SRB Account could have been applied to provide an increase of about 2.34% to all superannuation and supplementary retirement benefits in payment; the liability created by each additional 1% increase would have been equivalent to about 0.77% of payroll (the corresponding figures for December 1979 are estimated at 1.89% and 0.95%, respectively).

The balance sheet below differs from the balance sheet in Section VI only to the extent that the assets include a share of the Supplementary Retirement Benefits Account and the liabilities in respect of former contributors and their surviving spouses and children include the value of all supplementary benefits based on the Benefit Index for 1977.

	($ millions)
Assets	
Balance of Superannuation Account and share of Superannuation contributors in Supplementary Retirement Benefits Account	8,882.4
Credits from Government outstanding at December 31, 1977 and made in 1978	416.6
Present value of future instalments from contributors and related Government credits in respect of prior service	148.3
Total Assets	9,447.3
Deficit	781.5
	10,228.8
Liabilities	
Present value of prospective benefits to and in respect of active contributors	6,591.5
Present value of benefits to persons entitled to an annuity or annual allowance	3,637.3
Total Liabilities	10,228.8

* or accrued in the case of deferred annuities

APPENDIX 3

	Promotional Salary Scales		Salary Scales Including Promotional and 5.5% p.a. General Increases	
Age	Males	Females	Males	Females
18	.357	.396	.022	.024
19	.390	.412	.025	.027
20	.424	.429	.029	.030
21	.459	.447	.033	.032
22	.493	.466	.038	.036
23	.525	.486	.042	.039
24	.558	.507	.048	.043
25	.592	.529	.053	.048
26	.624	.551	.059	.052
27	.655	.573	.066	.057
28	.686	.596	.072	.063
29	.715	.619	.080	.069
30	.742	.642	.087	.075
31	.767	.664	.095	.082
32	.789	.686	.103	.090
33	.808	.707	.111	.098
34	.824	.728	.120	.106
35	.838	.748	.129	.115
36	.851	.767	.138	.124
37	.861	.785	.147	.134
38	.871	.802	.157	.145
39	.880	.819	.167	.156
40	.888	.834	.178	.167
41	.895	.849	.189	.180
42	.902	.863	.201	.193
43	.908	.876	.214	.206
44	.915	.888	.227	.221
45	.922	.899	.242	.236
46	.927	.910	.256	.252
47	.933	.919	.272	.268
48	.938	.928	.289	.286
49	.943	.936	.306	.304
50	.948	.943	.325	.323
51	.953	.950	.345	.344
52	.957	.956	.365	.365
53	.961	.962	.387	.387
54	.965	.967	.410	.411
55	.968	.971	.434	.435
56	.971	.975	.459	.461
57	.974	.979	.486	.488
58	.978	.982	.514	.517
59	.981	.985	.544	.547
60	.984	.988	.576	.578
61	.986	.990	.609	.611
62	.988	.992	.644	.646
63	.990	.994	.681	.683
64	.992	.995	.719	.722
65	.994	.996	.761	.762
66	.996	.997	.804	.805
67	.997	.998	.849	.850
68	.998	.998	.897	.897
69	.999	.999	.947	.947
70	1.000	1.000	1.000	1.000

APPENDIX 4

Select Rates of Termination for all Reasons

Age at beg. of Pens. Svc.	Males: Completed Years of Pensionable Service 0	1	2	3	4	Females: Completed Years of Pensionable Service 0	1	2	3	4
18	.430	.216	.142	.108	.080	.290	.170	.140	.135	.130
19	.405	.204	.133	.101	.072	.320	.200	.155	.142	.131
20	.380	.193	.125	.094	.067	.330	.225	.165	.147	.132
21	.353	.183	.119	.087	.063	.333	.235	.172	.150	.132
22	.329	.174	.112	.082	.061	.332	.237	.175	.152	.132
23	.308	.165	.108	.079	.061	.330	.238	.177	.152	.131
24	.290	.159	.104	.078	.060	.325	.239	.178	.151	.130
25	.275	.153	.100	.077	.060	.320	.240	.179	.150	.127
26	.262	.148	.097	.075	.059	.316	.238	.179	.145	.123
27	.251	.144	.094	.073	.059	.311	.235	.175	.138	.117
28	.243	.140	.092	.072	.058	.306	.230	.169	.132	.111
29	.237	.137	.090	.071	.058	.300	.220	.162	.125	.105
30	.231	.134	.088	.070	.057	.295	.210	.155	.118	.100
31	.226	.132	.087	.069	.056	.290	.204	.148	.112	.095
32	.224	.130	.085	.068	.055	.284	.197	.142	.107	.091
33	.220	.127	.084	.066	.054	.279	.190	.135	.101	.086
34	.218	.125	.083	.065	.053	.274	.183	.130	.096	.082
35	.216	.122	.082	.063	.052	.269	.177	.124	.093	.079
36	.215	.120	.080	.062	.051	.265	.170	.119	.089	.075
37	.215	.117	.079	.060	.050	.261	.165	.114	.086	.072
38	.214	.114	.078	.058	.049	.258	.160	.109	.083	.069
39	.214	.112	.077	.057	.048	.255	.155	.105	.080	.066
40	.213	.109	.076	.055	.047	.252	.152	.101	.078	.064
41	.213	.107	.075	.054	.046	.251	.148	.098	.076	.063
42	.212	.105	.074	.053	.045	.249	.145	.095	.075	.061
43	.212	.103	.073	.052	.045	.248	.143	.093	.074	.060
44	.212	.101	.072	.051	.045	.247	.140	.091	.073	.060
45	.212	.099	.071	.050	.045	.247	.138	.089	.072	.060
46	.212	.098	.070	.050	.045	.248	.136	.088	.072	.061
47	.212	.097	.069	.050	.045	.249	.135	.088	.073	.062
48	.213	.096	.069	.051	.045	.251	.135	.088	.075	.063
49	.214	.095	.069	.053	.046	.253	.136	.089	.077	.065
50	.215	.095	.069	.055	.048	.256	.137	.090	.079	.068
51	.217	.095	.069	.058	.049	.260	.138	.092	.082	.071
52	.220	.097	.070	.061	.051	.264	.140	.094	.085	.074
53	.224	.099	.072	.066	.054	.269	.142	.096	.088	.078
54	.230	.103	.075	.072	.060	.275	.145	.100	.092	.083
55	.236	.110	.079	.079	.070	.282	.150	.104	.097	.088
56	.245	.119	.085	.089	.088	.289	.155	.108	.102	.095
57	.255	.130	.095	.105	.114	.297	.160	.114	.108	.102
58	.268	.142	.116	.136	.188	.306	.167	.120	.114	.110
59	.285	.157	.136	.188	.240	.315	.175	.126	.120	.118

A P P E N D I X 5

Rates of Termination for Other Reasons than
age, age and service, disability or death
(five or more years of pensionable service)*

and

Proportions of Terminating Contributors Electing to take a
Deferred Annuity or Annual Allowance**

Age	Rates of Termination* Males	Rates of Termination* Females	Proportion Electing Deferred Annuity or Annual Allowance Males	Proportion Electing Deferred Annuity or Annual Allowance Females
20	.079	.125	.024	.014
21	.073	.125	.024	.014
22	.067	.128	.024	.014
23	.061	.128	.024	.014
24	.055	.126	.024	.014
25	.050	.122	.025	.015
26	.046	.118	.025	.015
27	.043	.113	.027	.015
28	.040	.107	.029	.016
29	.038	.100	.032	.018
30	.035	.092	.035	.021
31	.033	.082	.038	.025
32	.031	.072	.041	.030
33	.029	.064	.045	.036
34	.027	.057	.050	.043
35	.025	.052	.056	.051
36	.023	.047	.063	.060
37	.021	.044	.070	.070
38	.020	.041	.078	.081
39	.018	.039	.087	.093
40	.017	.037	.097	.106
41	.016	.034	.109	.120
42	.015	.033	.120	.140
43	.014	.031	.135	.165
44	.013	.030	.155	.190
45	.012	.028	.180	.220
46	.012	.027	.220	.260
47	.011	.025	.265	.300
48	.011	.024	.300	.340
49	.010	.023	.335	.380
50	.010	.021	.370	.415
51	.009	.020	.405	.450
52	.009	.019	.440	.490
53	.009	.019	.480	.535
54	.008	.018	.525	.585
55	.008	.018	.570	.635
56	.008	.017	.620	.685
57	.008	.017	.670	.735
58	.007	.016	.720	.785
59	.007	.016	.780	.835

* See Note 3 in Appendix 1

** Contributors who have attained age forty-five and completed ten years of pensionable service, must take a deferred annuity or annual allowance in respect of service after September 30, 1967.

APPENDIX 6

Rates of Retirement because of Age or Age and Service*

Age	Males	Females
55	.035	.030
56	.035	.030
57	.035	.030
58	.035	.030
59	.080	.085
60	.165	.175
61	.125	.145
62	.135	.150
63	.160	.155
64	.565	.585
65	.975	.980
66	.540	.625
67	.380	.470
68	.360	.400
69	.335	.645
70	1.000	1.000

* See Note 3 in Appendix 1

APPENDIX 7

Rates of Retirement because of Disability*

Age	Males	Females
20	.0002	.0007
21	.0002	.0008
22	.0002	.0009
23	.0002	.0010
24	.0002	.0010
25	.0002	.0010
26	.0002	.0011
27	.0002	.0011
28	.0002	.0012
29	.0002	.0012
30	.0002	.0013
31	.0003	.0014
32	.0003	.0015
33	.0003	.0016
34	.0004	.0017
35	.0005	.0018
36	.0006	.0020
37	.0008	.0022
38	.0009	.0024
39	.0012	.0026
40	.0014	.0029
41	.0017	.0033
42	.0020	.0036
43	.0023	.0041
44	.0028	.0046
45	.0033	.0052
46	.0039	.0060
47	.0045	.0070
48	.0053	.0081
49	.0063	.0096
50	.0073	.0114
51	.0086	.0131
52	.0100	.0146
53	.0114	.0158
54	.0128	.0167
55	.0142	.0174
56	.0155	.0186
57	.0170	.0194
58	.0185	.0204
59	.0200	.0210

* See Note 3 in Appendix 1

APPENDIX 8

Rates of Mortality for employed contributors

Age	Males	Females
20	.0005	.0003
21	.0006	.0003
22	.0006	.0003
23	.0006	.0003
24	.0007	.0003
25	.0007	.0003
26	.0006	.0003
26	.0006	.0003
28	.0006	.0003
29	.0006	.0003
30	.0006	.0003
31	.0006	.0003
32	.0006	.0004
33	.0006	.0004
34	.0007	.0004
35	.0007	.0005
36	.0008	.0005
37	.0009	.0006
38	.0010	.0006
39	.0011	.0007
40	.0013	.0008
41	.0014	.0009
42	.0016	.0010
43	.0018	.0012
44	.0021	.0013
45	.0024	.0014
46	.0028	.0016
47	.0032	.0018
48	.0036	.0020
49	.0041	.0021
50	.0046	.0023
51	.0051	.0025
52	.0057	.0027
53	.0063	.0030
54	.0069	.0032
55	.0075	.0035
56	.0081	.0037
57	.0087	.0040
58	.0094	.0043
59	.0100	.0046
60	.0107	.0050
61	.0114	.0053
62	.0121	.0057
63	.0129	.0062
64	.0137	.0067
65	.0145	.0073
66	.0153	.0079
67	.0161	.0085
68	.0170	.0091
69	.0179	.0098
70	.0189	.0105

APPENDIX 9

Rates of Mortality for contributors retired for reasons other than disability and Annuity Values based thereon

Age	Rate of Mortality		Value of Annuity of $1.00 per annum (interest at 6.5% per annum)		Value of Annuity of $1.00 per annum (interest at 3.5% per annum)*	
	Males	Females	Males	Females	Males	Females
50	.0066	.0027	11.967	13.321	16.565	19.285
51	.0073	.0029	11.793	13.192	16.220	18.977
52	.0080	.0031	11.615	13.056	15.873	18.661
53	.0088	.0034	11.433	12.914	15.525	18.337
54	.0097	.0036	11.248	12.766	15.174	18.005
55	.0106	.0039	11.058	12.611	14.821	17.666
56	.0115	.0042	10.865	12.448	14.465	17.319
57	.0125	.0046	10.667	12.279	14.108	16.964
58	.0135	.0049	10.464	12.102	13.748	16.601
59	.0145	.0054	10.257	11.917	13.385	16.231
60	.0157	.0058	10.044	11.725	13.019	15.853
61	.0169	.0064	9.827	11.525	12.651	15.468
62	.0182	.0069	9.603	11.316	12.279	15.075
63	.0197	.0076	9.375	11.100	11.905	14.676
64	.0213	.0083	9.141	10.875	11.529	14.269
65	.0231	.0091	8.903	10.641	11.152	13.856
66	.0250	.0099	8.660	10.399	10.774	13.436
67	.0272	.0109	8.414	10.148	10.396	13.010
68	.0296	.0119	8.164	9.889	10.018	12.577
69	.0322	.0131	7.911	9.619	9.642	12.138
70	.0351	.0144	7.655	9.341	9.267	11.693
71	.0383	.0160	7.397	9.053	8.894	11.243
72	.0418	.0179	7.138	8.757	8.525	10.789
73	.0456	.0201	6.878	8.455	8.160	10.332
74	.0499	.0225	6.617	8.145	7.798	9,875
75	.0545	.0252	6.356	7.829	7.442	9.416
76	.0596	.0285	6.096	7.508	7.092	8.957
77	.0652	.0322	5.838	7.182	6.748	8.501
78	.0714	.0365	5.581	6.853	6.411	8.048
79	.0781	.0414	5.328	6.522	6.082	7.600
80	.0855	.0470	5.077	6.190	5.760	7.159
81	.0936	.0534	4.830	5.859	5.448	6.724
82	.1024	.0608	4.588	5.530	5.144	6.299
83	.1121	.0693	4.350	5.203	4.850	5.885
84	.1227	.0790	4.119	4.882	4.566	5.482
85	.1342	.0901	3.893	4.567	4.292	5.093
86	.1467	.1030	3.673	4.261	4.028	4.720
87	.1603	.1177	3.460	3.965	3.775	4.364
88	.1751	.1345	3.255	3.682	3.533	4.028
89	.1912	.1539	3.057	3.416	3.302	3.715
90	.2085	.1762	2.866	3.170	3.082	3.429

* values used for parts (a) and (b) of Appendix 2
Exact interest rate is $\frac{1.065}{1.03} - 1$ or 3.398%

APPENDIX 10

Rates of Mortality for male contributors retired because of disability and Annuity Values based therein

Age	Ultimate Rate (applicable after at least 3 yrs. have elapsed from date of retirement)	Value of Annuity of $1.00 per annum: At date of retirement		Value of Annuity of $1.00 per annum: Applicable after at least 3 yrs. have elapsed from date of retirement	
		at 6.5%	at 3.5%*	at 6.5%	at 3.5%*
25	.0072	13.176	19.990	13.402	20.342
26	.0073	13.113	19.812	13.341	20.165
27	.0074	13.046	19.628	13.276	19.983
28	.0075	12.976	19.439	13.208	19.795
29	.0076	12.903	19.244	13.136	19.601
30	.0077	12.825	19.043	13.061	19.402
31	.0078	12.743	18.835	12.981	19.196
32	.0080	12.654	18.617	12.897	18.983
33	.0082	12.562	18.395	12.809	18.765
34	.0084	12.467	18.168	12.717	18.542
35	.0086	12.367	17.935	12.622	18.313
36	.0088	12.263	17.696	12.522	18.078
37	.0090	12.154	17.450	12.417	17.837
38	.0093	12.037	17.195	12.306	17.588
39	.0096	11.916	16.934	12.192	17.335
40	.0100	11.790	16.666	12.073	17.076
41	.0103	11.660	16.395	11.949	16.812
42	.0107	11.523	16.116	11.820	16.542
43	.0111	11.381	15.831	11.687	16.267
44	.0116	11.232	15.538	11.547	15.985
45	.0122	11.076	15.238	11.404	15.699
46	.0128	10.916	14.934	11.256	15.410
47	.0135	10.751	14.625	11.103	15.117
48	.0142	10.581	14.313	10.947	14.820
49	.0150	10.407	13.996	10.787	14.520
50	.0158	10.228	13.677	10.622	14.217
51	.0167	10.043	13.352	10.453	13.911
52	.0177	9.853	13.023	10.280	13.602
53	.0188	9.658	12.691	10.103	13.291
54	.0200	9.459	12.358	9.923	12.980
55	.0212	9.258	12.024	9.741	12.667
56	.0225	9.052	11.687	9.555	12.353
57	.0240	8.840	11.347	9.365	12.038
58	.0256	8.626	11.007	9.174	11.723
59	.0273	8.409	10.666	8.980	11.409
60	.0292			8.785	11.097
65	.0400			7.794	9.565
70	.0549			6.779	8.087
75	.0751			5.757	6.679
80	.1044			4.749	5.365
85	.1464			3.788	4.172
90	.2084			2.867	3.082

* values used for parts (a) and (b) of Appendix 2
Exact interest rate is $\frac{1.065}{1.03} - 1$ or 3.398%

APPENDIX 11

Rates of Mortality for female contributors retired because of disability and Annuity Values based thereon

Age	Ultimate Rate (applicable after at least 3 yrs. have elapsed from date of retirement	Value of Annuity of $1.00 per annum: At date of retirement at 6.5%	At date of retirement at 3.5%*	Applicable after at least 3 yrs. have elapsed from date of retirement at 6.5%	Applicable after at least 3 yrs. have elapsed from date of retirement at 3.5%*
25	.0069	13.619	21.308	13.753	21.523
26	.0070	13.577	21.171	13.713	21.388
27	.0071	13.534	21.032	13.671	21.250
28	.0072	13.489	20.889	13.627	21.109
29	.0073	13.442	20.742	13.582	20.964
30	.0074	13.393	20.592	13.535	20.815
31	.0075	13.343	20.437	23.485	20.661
32	.0076	13.290	20.279	13.434	20.504
33	.0077	13.235	20.116	13.380	20.342
34	.0078	13.177	19.949	13.324	20.176
35	.0079	13.117	19.776	13.265	20.004
36	.0080	13.054	19.599	13.202	19.827
37	.0081	12.988	19.416	13.137	19.645
38	.0082	12.917	19.227	13.069	19.458
39	.0084	12.842	19.030	12.996	19.264
40	.0086	12.764	18.829	12.921	19.066
41	.0088	12.684	18.623	12.843	18.863
42	.0090	12.600	18.413	12.762	18.656
43	.0092	12.514	18.198	12.678	18.443
44	.0094	12.423	17.978	12.590	18.225
45	.0096	12.329	17.752	12.498	18.001
46	.0098	12.231	17.521	12.402	17.772
47	.0100	12.127	17.282	12.301	17.535
48	.0103	12.018	17.035	12.195	17.292
49	.0106	11.904	16.783	12.085	17.043
50	.0109	11.786	16.525	11.970	16.789
51	.0112	11.663	16.260	11.850	16.528
52	.0116	11.533	15.988	11.725	16.260
53	.0120	11.399	15.710	11.594	15.987
54	.0124	11.259	15.427	11.459	15.708
55	.0128	11.114	15.137	11.318	15.422
56	.0133	10.961	14.839	11.171	15.129
57	.0138	10.803	14.535	11.017	14.830
58	.0144	10.638	14.223	10.858	14.524
59	.0150	10.466	13.905	10.692	14.213
60	.0157			10.520	13.895
65	.0203			9.563	12.220
70	.0277			8.443	10.422
75	.0401			7.171	8.544
80	.0620			5.785	6.656
85	.1048			4.396	4.894
90	.1762			3.170	3.428

* values used for parts (a) and (b) of Appendix 2
Exact interest rate is $\frac{1.065}{1.03} - 1$ or 3.398%

APPENDIX 12A

Rates of Remarriage and Mortality assumed for widows and Annuity Values based thereon

Age at becoming widow	Remarriage Rates: Year of Widowhood 1st yr.	3rd yr.	5th yr.	Attained Age	Ultimate Remarriage Rate**	Mortality Rate	Attained Age	Mortality Rate
25	.050	.148	.132					
30	.029	.086	.076	30	.061	.0013	65	.0156
35	.018	.048	.042	35	.040	.0018	70	.0255
40	.011	.027	.023	40	.025	.0023	75	.0400
45	.006	.015	.012	45	.014	.0027	80	.0606
50	.004	.008	.006	50	.008	.0036	85	.0385
55	.002	.004	.003	55	.004	.0055	90	.1268
				60	.002	.0093	95	.1808

Value of Annuity of $1.00 per annum payable to remarriage or death of widow

Age at becoming widow	Year of Widowhood 1st yr.	3rd yr.	5th yr.	Attained Age	Ultimate**	Attained Age	Ultimate**
Interest: 6.5%							
25	6.563	6.638	7.823				
30	8.974	9.118	10.034	30	10.033	65	9.846
35	10.906	10.991	11.537	35	11.341	70	8.667
40	12.030	12.018	12.258	40	12.212	75	7.463
45	12.468	12.330	12.316	45	12.538	80	6.292
50	12.316	12.077	11.870	50	12.352	85	5.196
55	11.768	11.420	11.076	55	11.784	90	4.183
				60	10.910	95	3.275
Interest: 3.5%*							
25	9.034	9.408	11.380				
30	13.052	13.422	14.902	30	14.906	65	12.715
35	16.179	16.321	17.115	35	19.964	70	10.831
40	17.791	17.679	17.913	40	18.122	75	9.035
45	18.133	17.771	17.575	45	18.261	80	7.394
50	17.475	16.942	16.457	50	17.539	85	5.937
55	16.212	15.537	14.878	55	16.240	90	4.658
				60	14.561	95	3.562

* values used for parts (a) and (b) of Appendix 2
Exact interest rate is $\frac{1.065}{1.03} - 1$ or 3.398%

** Remarriage rates are select for 14 years

APPENDIX 12B

Rates of Remarriage and Mortality assumed for widowers and Annuity Values based thereon

Age at becoming widower	Remarriage Rates			Attained Age	Ultimate Remarriage Rate	Mortality Rate	Attained Age	Mortality Rate
	Year of being a widower							
	1st yr.	3rd yr.	5th yr.					
25	.071	.258	.258					
30	.065	.215	.198	30	.198	.0015	65	.0296
35	.047	.130	.116	35	.139	.0019	70	.0444
40	.031	.078	.069	40	.094	.0029	75	.0655
45	.019	.048	.040	45	.059	.0046	80	.0970
50	.013	.028	.022	50	.027	.0076	85	.1436
55	.008	.014	.011	55	.014	.0121	90	.2098
				60	.009	.0192	95	.3003

Value of Annuity of $1.00 per annum payable to remarriage or death or widower

Age at becoming widower	Year of being a widower			Attained Age	Ultimate**	Attained Age	Ultimate**
	1st yr.	3rd yr.	5th yr.				
Interest: 6.5%							
25	3.824	3.308	3.961				
30	4.722	4.526	5.537	30	4.475	65	8.349
35	6.724	6.706	7.560	35	6.201	70	7.171
40	8.634	8.632	9.250	40	8.027	75	5.996
45	9,913	9.832	10.159	45	9.551	80	4.858
50	10.273	10.093	10.104	50	10.290	85	3.814
55	10.083	9.785	9.553	55	10.076	90	2.911
				60	9.422	95	2.167
Interest: 3.5%*							
25	4.401	3.895	4.833				
30	5.793	5.717	7.213	30	5.547	65	10.344
35	8.853	8.970	10.253	35	8.170	70	8.607
40	11.778	11.820	12.689	40	10.938	75	6.981
45	13.586	13.419	13.783	45	13.094	80	5.496
50	13.866	13.506	13.391	50	13.906	85	4.205
55	13.287	12.749	12.299	55	13.282	90	3.137
				60	12.056	95	2.290

* Values used for parts (a) and (b) of Appendix 2.
Exact interest rate is $\frac{1.065}{1.03} - 1$ or 3.398%

** Remarriage rates are select for 5 years

A P P E N D I X 13

Proportions of Contributors Married at Death and Average Ages of Spouses Corresponding to Ages of Contributors at Death

Age of Contributor At Death	Males			Females		
	Proportions Married		Average Age of Widow	Proportions Married		Average Age of Widower
	Employed Contributor	Retired Contributor		Employed Contributor	Retired Contributor	
25	.720	.315	24.36	.700	.525	25.69
30	.720	.455	29.02	.815	.595	31.07
35	.860	.575	33.68	.840	.625	36.52
40	.890	.673	38.34	.825	.630	42.03
45	.890	.749	42.98	.800	.620	47.57
50	.910	.802	47.60	.750	.580	53.12
55	.920	.828	52.20	.665	.480	58.71
60	.905	.826	56.77	.580	.370	64.35
65	.860	.797	61.30	.480	.315	70.07
70	.810	.737	65.78	.380	.265	75.98

Proportions of Students Entitled to Allowances Remaining Eligible for Allowances at the end of the year of age

Age	Proportion
18	0.74
19	0.68
20	0.67
21	0.60
22	0.54
23	0.53
24	0.31

APPENDIX 14

Age	Proportion of contributors with salaries below Y.M.P.E.*		Ratio of average salary to Y.M.P.E.* for contributors below that maximum	
	Males	Females	Males	Females
18	.910	.990	.700	.640
19	.870	.980	.730	.690
20	.830	.970	.760	.720
21	.790	.950	.785	.740
22	.740	.930	.805	.750
23	.690	.900	.820	.760
24	.630	.860	.835	.770
25	.560	.810	.845	.780
26	.480	.760	.855	.790
27	.390	.700	.865	.800
28	.350	.675	.865	.810
29	.310	.650	.870	.815
30	.270	.640	.870	.815
31	.240	.630	.870	.815
32	.220	.620	.870	.815
33	.215	.630	.870	.815
34	.210	.640	.870	.815
35	.205	.650	.870	.815
36	.205	.660	.870	.815
37	.200	.670	.870	.815
38	.205	.680	.870	.815
39	.210	.690	.870	.815
40	.215	.695	.870	.810
41	.220	.700	.870	.810
42	.225	.705	.870	.810
43	.230	.710	.870	.810
44	.235	.715	.870	.810
45	.240	.715	.865	.810
46	.250	.715	.865	.810
47	.260	.715	.865	.810
48	.265	.715	.865	.810
49	.270	.715	.865	.810
50	.280	.715	.860	.810
51	.285	.715	.860	.810
52	.290	.715	.860	.810
53	.300	.715	.860	.810
54	.310	.715	.860	.810
55	.320	.720	.855	.810
56	.330	.720	.855	.810
57	.345	.720	.855	.810
58	.360	.725	.855	.810
59	.375	.730	.855	.810
60	.390	.735	.850	.805
61	.405	.745	.850	.800
62	.420	.755	.850	.795
63	.420	.755	.840	.785
64	.400	.755	.830	.775
65	.380	.755	.820	.760
66	.350	.755	.810	.745
67	.310	.755	.800	.730
68	.270	.755	.790	.715
69	.230	.755	.780	.700
70	.200	.755	.770	.685

* Y.M.P.E. = "Year's Maximum Pensionable Earnings"
(Canada Pension Plan) which for this purpose was assumed to be at the level of the industrial composite average of annual wages and salaries

APPENDIX 15

Age Distribution of employees who became contributors during the period from January 1, 1973 to December 31, 1977

Age at Entry	Males: Number	Males: Cumulative Proportion	Females: Number	Females: Cumulative Proportion
18	2518	2.1%	5880	5.8%
19	4112	5.6	5916	11.6
20	6577	11.1	7983	19.5
21	7371	17.3	7845	27.2
22	7765	23.8	7603	34.7
23	7919	30.5	7223	41.8
24	7841	37.1	6488	48.1
25	7201	43.2	5523	53.6
26	6528	48.6	4493	58.0
27	5762	53.5	3973	61.9
28	4987	57.7	3256	65.1
29	4178	61.2	2743	67.8
30	3590	64.2	2416	70.2
31	3062	66.8	2024	72.2
32	2632	69.0	1863	74.0
33	2255	70.9	1745	75.7
34	2041	72.6	1604	77.3
35	1880	74.2	1484	78.8
36	1648	75.6	1436	80.2
37	1552	76.9	1399	81.6
38	1469	78.1	1346	82.9
39	1319	79.2	1261	84.1
40	1353	80.4	1217	85.3
41	1347	81.5	1168	86.5
42	1346	82.6	1142	87.6
43	1346	83.8	1129	88.7
44	1408	85.0	1052	89.7
45	1419	86.2	995	90.7
46	1337	87.3	960	91.7
47	1366	88.4	899	92.6
48	1235	89.5	879	93.4
49	1323	90.6	896	94.3
50	1331	91.7	787	95.1
51	1413	92.9	742	95.8
52	1242	93.9	747	96.5
53	1129	94.9	641	97.2
54	1008	95.7	570	97.7
55	921	96.5	501	98.2
56	774	97.2	420	98.6
57	656	97.7	368	99.0
58	561	98.2	272	99.3
59	463	98.6	206	99.5
60	419	98.9	175	99.6
61	389	99.2	113	99.7
62	294	99.5	84	99.8
63	297	99.7	91	99.9
64 +	304	100.0	80	100.0
Total:	118,888		101,638	

Mean Age: Males 30.71; Females 28.52

APPENDIX 16

Age Distribution of contributors employed in the Public Service on December 31, 1977

	Males		Females	
Age	Number	Cumulative Proportion	Number	Cumulative Proportion
18	111	0.1%	272	0.3%
19	573	0.3	1334	1.7
20	1040	0.9	2007	3.7
21	1825	1.8	2944	6.7
22	2424	3.0	3501	10.3
23	3359	4.7	4163	14.6
24	4248	6.8	4708	19.5
25	4983	9.3	4894	24.5
26	5622	12.1	4621	29.2
27	6121	15.2	4383	33.7
28	6405	18.4	3897	37.7
29	6692	21.8	3591	41.4
30	6867	25.2	3342	44.9
31	6987	28.7	3052	48.0
32	5782	31.6	2403	50.5
33	5198	34.2	2038	52.6
34	5008	36.7	1912	54.5
35	5013	39.3	1818	56.4
36	4680	41.6	1728	58.2
37	4372	43.8	1680	59.9
38	3921	45.8	1603	61.5
39	3956	47.8	1515	63.1
40	3929	49.7	1630	64.8
41	3825	51.6	1467	66.3
42	3905	53.6	1549	67.9
43	3894	55.6	1583	69.5
44	3857	57.5	1519	71.1
45	4082	59.5	1557	72.7
46	4254	61.7	1544	74.3
47	4260	63.8	1569	75.9
48	4141	65.9	1541	77.4
49	4091	67.9	1527	79.0
50	4050	70.0	1644	80.7
51	4316	72.1	1581	82.3
52	4728	74.5	1726	84.1
53	5249	77.1	1812	86.0
54	5482	79.9	1836	87.9
55	5498	82.7	1741	89.6
56	5616	85.5	1677	91.4
57	5341	88.1	1551	93.0
58	5076	90.7	1485	94.5
59	4126	92.8	1151	95.7
60	3627	94.6	1036	96.7
61	3015	96.1	914	97.7
62	2664	97.4	810	98.5
63	2359	98.6	690	99.2
64	1920	99.6	533	99.8
65 +	836	100.0	231	100.0
Total:	199,328		97,310	

Mean Age: Males 41.44; Females 36.31