CANADA PENSION PLAN

SIXTEENTH ACTUARIAL REPORT

SEPTEMBER 1997

24 September 1997

The Honourable Paul Martin, P.C., M.P.
Minister of Finance
House of Commons
Ottawa, Ontario
K1A 0G5

Dear Minister,

Subject: CPP Sixteenth Statutory Actuarial Report
(Our file: P6360-5)

In compliance with subsection 115(2) of the Canada Pension Plan Act, which provides that a periodic actuarial report shall be prepared whenever a Bill is introduced in the House of Commons to amend the CPP, I am pleased to transmit the sixteenth actuarial report on the Canada Pension Plan.

Bernard Dussault
Chief Actuary

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OVERVIEW

Federal-Provincial Agreement

On 14 February 1997, the Minister of Finance announced that the federal government had reached an agreement with eight of the ten provincial governments to change some financing (including investment) and benefit provisions of the Canada Pension Plan (CPP), which provides retirement, disability and survivor benefits to workers in Canada excluding Québec. The purpose of this report is to indicate the effect of the 14 February agreement on the projected long term financial status of the CPP.

Th February 1997 agreement was reached pursuant to the quinquennial federal-provincial review of the CPP on the basis of the fifteenth actuarial report as at 31 December 1993. Such reviews will now be made every three years, the next one to be made on the basis of the seventeenth actuarial report that will be prepared as at 31 December 1997.

Projected Financial Status of the Existing CPP **(Ignoring the changes)**

The Account balance of $37.9 billion at the end of 1996 corresponded to about two years of expenditures. Under the existing plan, this Account/expenditure ratio of 2 corresponds to a funded ratio of about 6%, i.e. to an unfunded proportion of 94%. As per the current 25-year schedule, the 1996 contribution rate of 5.6% would gradually increase to 10.1% at the schedule's expiration in 2016.

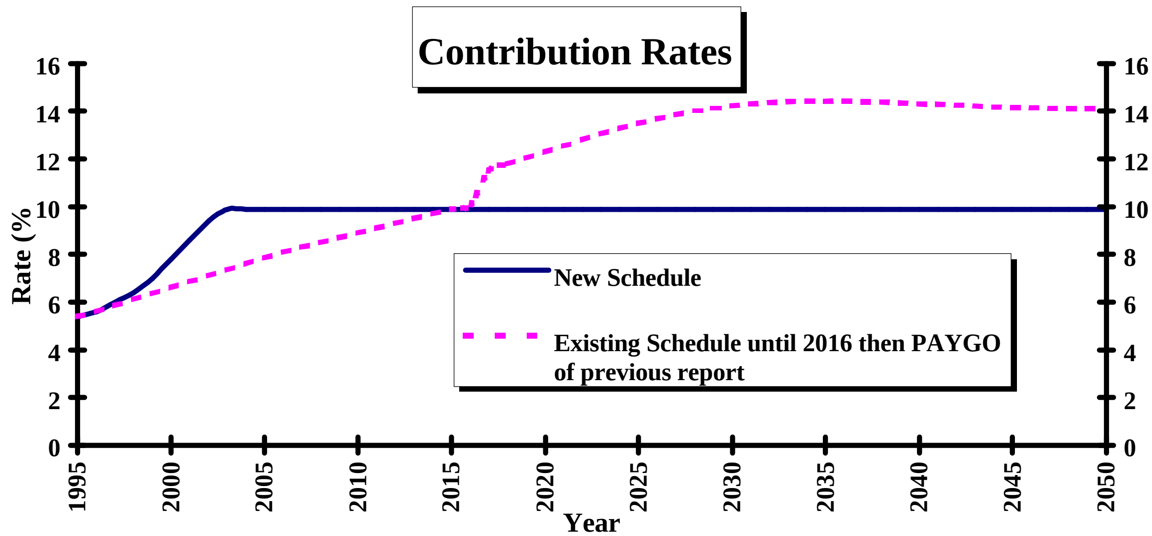
As indicated in table 1A of the fifteenth actuarial report on the CPP, if no changes were made to the CPP, the projected Account balance would gradually decrease and vanish by the end of 2015. In order to continue paying benefits, the plan's financing would then, with an empty Account, have to shift to the pay-as-you-go basis, which would have meant a contribution rate further increasing gradually to 14.2% in 2030.

Alternately, table 1B of the fifteenth report indicates that maintaining a Account/expenditure ratio target of 2 instead of zero would require a gradually increasing contribution rate from 5.6% in 1996 to 13.9% in 2030, after which time it would remain essentially stable at that level.

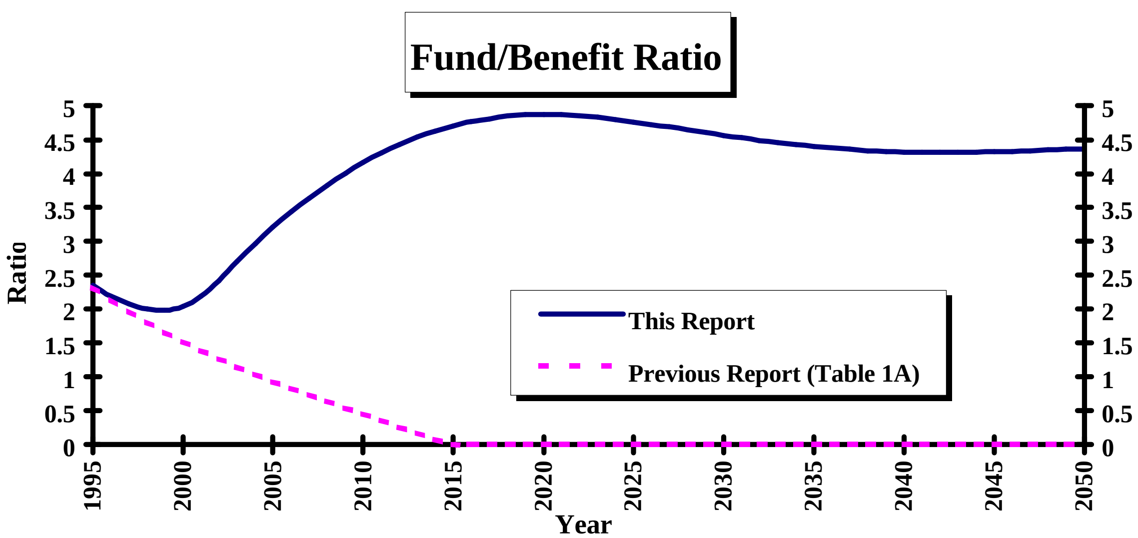
Projected Financial Status of the Modified CPP

The 1996 contribution rate of 5.6% is scheduled to:

- increase more quickly than under the existing 25-year schedule;
- become stable much sooner (in 2003 versus 2030);
- reach a materially lower stable level (9.9% versus 13.9%).



The Account/expenditure ratio of about 2 at the end of 1996 is projected to increase gradually to a level of 4.9 around 2020 and then decrease gradually to 4.3 around 2040, after which time it would remain essentially stable until 2075. Under the modified plan, a long term Account/expenditure ratio of 4.3 (versus 2 for the existing plan) corresponds to a funded ratio of 17% (versus 6% for the existing plan).



Summary Description of the CPP Modifications

The modifications to the plan provisions entailing the above mentioned changes in the projected financial status of the CPP are described below. For purposes of making cost comparisons with the previous report, it has been assumed that the existing financing approach, which targets an Account equivalent to 2 years of expenditures, would have been preserved starting in 1997 as shown in Table 1B of that report. The financial effect of the Bill is therefore presented by showing how the contribution rate of 13.9% for 2030 from Table 1B of the previous report is reduced to the stable rate of 9.9% applying for 2003 and later years. Of this expected reduction of 4 percentage points in the contribution rate, the financing-related modifications account for about 3 percentage points while the benefit-related modifications account for about 1 percentage point. The relative weight of the measures that account for this 4-point reduction can be appropriately considered applicable as well if the pay-as-you-go rate of 14.2% projected for 2030 were taken as the reference point.

A- Financing and Investments

1. **Contribution Rate: Acceleration of Annual Increases and Stabilization**
   Under the existing 25-year schedule, the contribution rate of 5.6% for 1996 would have increased gradually to 10.1% in 2016, and would, in the absence of federal-provincial agreement, have eventually increased to the pay-as-you-go cost rate of 14.2% projected for 2030. With the federal-provincial agreement, the contribution rate will still increase gradually but more quickly to reach a lower stable level of 9.9% in 2003. With the existing schedule, the level of 9.9% would be reached in 2015.

2. **Diversified Investment Portfolio**
   A new CPP Investment Board will be created to invest, at arm's length from governments, the CPP funds in a diversified investment portfolio. The real return (net of CPI increases) on the CPP Account is thus expected to increase from 2.5% to 3.8%. Taken together, the accelerated contribution rate increases and the new investment policy are expected to reduce by 1.5 percentage point the stable contribution rate.

3. **Freezing the Year's Basic Exemption (YBE)**
   The YBE of $3,500 for 1997 would remain at this level indefinitely instead of keeping in line with the Year's Maximum Pensionable Earnings (YMPE). Freezing the YBE is expected to reduce by 1.4 percentage point the stable contribution rate but does not materially affect ultimately the absolute amount of contributions as it also produces a gradual compensatory increase in the contributory base and brings in additional contributors with small earnings not exceeding 10% of the YMPE.

B- Benefits

As at 31 December 1997, all CPP benefits already in pay as well as anyone over age 65 would not be affected by the Bill which mainly aim at strengthening some of the entitlement rules and limits. Aggregate benefit expenditures otherwise projected for 2030 are thereby expected to be reduced by 9.1%, which would reduce the estimated stable contribution rate by 1.1 percentage point. Benefit changes can be summarized as follows:

1. More stringent work attachment rules will apply for entitlement to disability benefits in terms of the minimum years of contributions just prior to disablement. Under the existing plan, contributors must have contributed to the CPP for at least 2 of the last 3 years or 5 of the last 10 years immediately preceding disablement. This will change to having employment earnings not below 10% of the YMPE over at least 4 of the last 6 years.

2. Corrective measures to the administration of disability benefits were implemented in September 1995. These are expected to reduce the assumed annual rate of new disability cases from 5.5 to 5.0 per 1,000 eligible contributors.

3. The automatic conversion at age 65 of a disability benefit in pay into a retirement benefit will be based on the YMPE averaged at time of disablement rather than at age 65. In other words, the indexing of the retirement pension from disablement to age 65 will be in line with prices rather than salaries.

4. Limits on the earnings-related portion of combined survivor/retirement pensions and combined survivor/disability pensions will be reduced to levels comparable to those applied until 1986 to combined survivor/retirement pensions.

5. The limit on the death benefit (which continues as a lump sum corresponding to 6 months of a retirement pension) is reduced from 10% of the YMPE, currently $3,580, to a constant $2,500.

6. The earnings index involved in the determination of the initial rate of a pension will be based on the YMPE average over the last 5 years, instead of the last 3 years.

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I- Introduction

A- Context of this sixteenth actuarial report on the CPP

In early September 1997, I was informed that the Minister of Finance was expecting to introduce soon in the House of Commons a Bill to change the CPP along the lines of the federal-provincial agreement of 14 February 1997.

Subsection 115(2) of the CPP provides that, whenever a Bill is introduced in the House of Commons to amend the CPP, the Chief Actuary of OSFI shall prepare, in accordance with a request from the Minister of Finance, a report setting forth the extent to which such Bill would, if enacted by Parliament, materially affect, using the same actuarial assumptions and basis as were used in the most recent actuarial report, any of the estimates contained in that report. The most recent statutory report is the fifteenth actuarial report as at 31 December 1993 which was tabled in the House of Commons on 28 February 1995. Therefore, this sixteenth report has been prepared on the basis of the fifteenth report to show the effect of the amending Bill on the long-term financial status of the CPP.

If it were not for the amending Bill, the CPP would be subject to a statutory triennial actuarial review as at 31 December 1996 and subsequently to a quinquennial review as at 31 December 1998. However, the amending Bill reduces from five to three years the frequency of the federal-provincial reviews of the CPP and specifies that the next review, corresponding to the first review on a triennial basis, is to be as at 31 December 1997. Therefore the next (seventeenth) statutory actuarial review of the CPP will be as at 31 December 1997. As the proposed frequency of ministerial reviews will now be the same (i.e. triennial) as that applying to actuarial reviews, the periodical actuarial reports will now be prepared once every three years instead of twice every five years.

B- Effective date of the changes

In accordance with subsection 114 of the CPP, the provisions of the amending Bill shall come into force only on a day to be fixed by proclamation of the Governor in Council. The proclamation may not be issued and shall not in any case have any force or effect unless the lieutenant governor in council of each of at least two-thirds of the included provinces, having in the aggregate not less than two-thirds of the population of all the included provinces, has signified the consent of that province thereto.

For purposes of financial estimates in this report, the deemed effective date of the changes is 1 January 1998, except for:

- the schedule of contribution rates, in which case it is 1 January 1997; and
- the implementation of corrective measures to the administration of disability benefits, in which case it is September 1995.

C- Definitions

Year's Maximum Pensionable Earnings (YMPE)

The *YMPE* for any calendar year corresponds to the limit above which that year's employment earnings are not subject to contributions and benefits. For 1997, the YMPE is $35,800.

Year's Basic Exemption (YBE)

The *YBE* for any calendar year corresponds to the lower limit below which that year's employment earnings are not subject to contributions. For 1997, the YBE is $3,500.

Contributory Earnings

Contributory earnings for any calendar year correspond to the portion of employment earnings on which contributions are payable, i.e. employment earnings between the YBE and the YMPE for that year.

Contribution rate

The *contribution rate* is divided equally between the employer and the employee. Self-employed persons pay the combined rate. The contribution rate applied to the CPP contributory earnings determines the amount of annual contributions.

Pay-as-you-go rate

Pay-as-you-go rate corresponds to the contribution rate that would apply if the balance in the Account were zero, i.e. the ratio of the year's expenditure (benefits plus administrative expenses) to the year's contributory earnings.

II- Description and Effect of Each Modification in the Amending Bill

The main provisions of the existing CPP are described in Appendix A of the previous (fifteenth) actuarial report. This description is not reproduced in this report. With the amending Bill, federal-provincial reviews of the CPP contribution rates will now take place every three years instead of five, and will concern the stable contribution rate of 9.9% for 2003 and later years instead of the 25-year schedule of contribution rates. The first of these triennial reviews is to be concluded by the end of 2000 and will be based on the next actuarial report as at 31 December 1997. For each future federal-provincial review of the CPP, the Chief Actuary will be accordingly required to update the estimate of the stable contribution rate on the basis of the evolving experience of the plan. This estimate will be based on a formula to be prescribed by the CPP regulations. The formula used for purposes of the 14 February 1997 federal-provincial agreement rests on the Account/expenditure ratio projected for 2100 being at the same level as that projected for 2030.

A- Breaking down the aggregate financial effect of the Bill

The effect of the amending Bill on the projected financial status of the CPP presented in the previous (fifteenth) actuarial report is shown on an aggregate basis in section IV below. This was done on a step by step basis according to a specific order by determining for each calendar year of the projection period the effect of each change proposed in the Bill on the various criteria (enumerated in the next paragraph) of the financial status of the CPP. The effect of any single modification may vary depending on the order in which it is determined through the step by step valuation process. The order selected to determine the effect of each change is as presented in this section.

The criteria selected for measuring year to year the CPP projected aggregate financial status consist of the pay-as-you-go rate, the contribution rate, the amount of benefits, the Account balance and the Account/Expenditure ratio. Each modification affects the contribution rate, the Account balance and the Account/Expenditure ratio, but not necessarily the pay-as-you-go rate and the amount of benefits. For example, the financing-related modifications affect the contribution rate but not the amount of benefits. In this connection, the change in the investment policy, though having a material effect on the stable contribution rate applicable after year 2002, has no effect on the amount of benefits and the on pay-as-you-go rate. Considering the above, it was decided for the sake of simplicity to express the effect of each financing-related change relative to the stable contribution rate, deemed for the existing plan to correspond to the contribution rate of 13.9% projected for 2030 as per Table 1B of the previous report, and the effect of each benefits-related change relative to both the pay-as-you-go rate and the amount of benefits projected for the year 2030.

B- Financing

1. **Contribution rate: acceleration of annual increases and stabilization**
   With the amending Bill, the 1996 contribution rate of 5.6% is scheduled to increase gradually to a stable level of 9.9% in 2003. Under the existing 25-year schedule, the level of 9.9% would have been reached only in 2015. The modified schedule compares as follows with the existing 25-year schedule (1991-2016):

Year	Schedule of contribution rates existing	Schedule of contribution rates modified
	%	%
1997	5.85	6.00
1998	6.10	6.40
1999	6.35	7.00
2000	6.60	7.80
2001	6.85	8.60
2002	7.10	9.40
2003	7.35	9.90
2004	7.60	9.90
2005	7.85	9.90
2010	8.90	9.90
2015	9.90	9.90
2030	N/A	9.90
2050	N/A	9.90
2075	N/A	9.90
2100	N/A	9.90

The level of the stable rate of 9.9%, deemed to apply from 2003 to 2100, was determined to make the Account/expenditure ratio projected at the end of 2100 equal to that projected at the end of 2030. The result was then rounded to the nearest one decimal point.

The effect of the accelerated annual contribution rate increases on the stable contribution rate is discussed below with that of the new investment policy.

2. Investments

A new CPP Investment Board would be created to invest the CPP funds (i.e. net cash flows in excess of amounts required for the Operating Balance) in a diversified investment portfolio.

The combined effect on the stable contribution rate of the accelerated annual contribution rate increases and of the new investment policy is a reduction of 1.5 percentage point. Taken in isolation,

- the new investment policy is expected to reduce by 0.3 percentage point the stable contribution rate. If its effect were measured after that of the fuller funding resulting from the accelerated increases in contribution rates, it would then represent a reduction of 1 point; and
- the acceleration of the annual increases in the contribution rate is expected to reduce the stable contribution rate by 0.5 percentage point. If its effect were estimated after that of the change in investment policy, it would then represent a reduction of 1.2 point.

The following transitional and permanent measures will apply regarding future investment in provincial securities:

- provincial borrowings from the CPP will be at the same interest rate as provinces pay on their market borrowings;
- at their next respective maturity date, all existing CPP 20-year provincial bonds would be renewable for another 20-year term provided they are not required for the payment of benefits;
- in the 3-year period following the effective date of the Bill, not more than 50% of the new CPP funds that the Investment Board chooses to invest in bonds will be in provincial securities; and
- after this 3-year period, new CPP funds invested in provincial securities will be limited to the proportion of provincial bonds held by pension funds in general.

3. Freezing the YBE

The YBE, corresponding to 10% of the YMPE but rounded to the next lower multiple of $100, would remain indefinitely at its 1997 level of $3,500 instead of keeping in line with the YMPE which increases annually at the rate of increase in wages. Freezing the YBE is expected to reduce the stable contribution rate by 1.4 percentage point but does not materially affect the amount of contributions as it produces a gradual compensatory increase in the contributory base and as the earnings of the additional contributors it brings in are small considering they do not exceed 10% of the YMPE.

C- Benefits

As at 31 December 1997, all CPP benefits already in pay as well as anyone over age 65 would not be affected by the Bill's changes which mainly aim at strengthening some of the benefit entitlement rules and limits. Benefit expenditures otherwise projected for 2030 are thereby expected to be reduced in aggregate by 9.1%, which would reduce by 1.1 percentage point the estimated stable contribution rate and by 1.17 percentage point the pay-as-you-go rate projected for 2030. The changes to benefit-related provisions can be summarized as follows:

1. Eligibility for disability benefits (work attachment rules)

More stringent work attachment rules will apply for the approval of new disability pensions. Under the existing plan, one must have contributed to the CPP for at least 2 of the last 3 years or 5 of the last 10 years just before disablement. This will change to having employment earnings not below 10% of the YMPE over at least 4 of the last 6 years in respect of disability emerging after 1997. This measure is expected to reduce by 6.5% in aggregate disability benefits otherwise projected for 2030. This corresponds to a reduction of 0.14 percentage point in the pay-as-you-go rate projected for 2030.

2. Administration of disability benefits

Beginning in 1994, the CPP administration initiated a range of measures designed to effectively manage the growing pressure on the disability program. In September 1995, the guidelines for the determination of disabilities were revised, on the basis of judicial positions, to put the emphasis back on the medical basis and to de-emphasize the use of socio-economic factors. The guidelines are used at all levels in the determination process, thus greatly increasing consistency in decision making. These measures are expected to reduce by 9.4% in aggregate disability benefits otherwise projected for 2030. This corresponds to a reduction of 0.19 percentage point in the pay-as-you-go rate projected for 2030.

Other measures, including increased reassessments of the disability status, expansion of vocational rehabilitation services and the implementation of a formal quality assurance program are also expected to reduce the aggregate level of disability benefits. However, it is too early at this time to properly estimate such reductions.

3. Conversion of disability pensions into retirement pensions at age 65

The automatic conversion at age 65 of a disability pension in pay into a retirement pension will be based on the YMPE averaged at time of disablement rather than at age 65. In other words, the pension indexing from disablement to age 65, that is involved in the determination of the initial rate of the retirement pension, will be in line with increases in prices rather than wages. However, special adjustments apply for this purpose to the YMPE for 1966 to 1986, in respect of disabilities that commenced before 1987, in order to smooth out the effect of the series of special formulas used to increase or freeze the YMPE during those years. This measure is expected to reduce by 1.6% in aggregate the retirement benefits otherwise projected for 2030. This corresponds to a reduction of 0.11 percentage point in the pay-as-you-go rate projected for 2030.

4. Limits on combined pensions

Limits on the earnings-related portion of combined survivor/retirement pensions and combined survivor/disability pensions will be reduced, in respect of any of the two components of a combined pension emerging after 1997 (except if before 1998 the surviving spouse had already attained age 65 or was already in receipt of a retirement pension), to levels comparable to those applied until 1986 to combined survivor/retirement pensions. This measure affects surviving spouses' benefits only and is expected to reduce by 12.1% their aggregate value otherwise projected for 2030. This corresponds to a reduction of 0.15 percentage point in the pay-as-you-go rate projected for 2030.

In the case of a beneficiary in receipt of both a surviving spouse pension and a retirement pension, the earnings-related portion of the combined pension is accordingly equal, provided it does not exceed the maximum retirement pension applicable when the second of the two pensions emerges, to the greater of:

- 100% of the survivor's own retirement pension plus 60% of the regular survivor pension (which corresponds to a reduction of the survivor pension from 60% to 36% of the deceased contributor's retirement pension for beneficiaries over age 65, and from 37.5% to 22.5% otherwise); and
- 100% of the survivor pension plus 60% of the survivor's regular own retirement pension.

In the case of a beneficiary in receipt of both a survivor pension and a disability pension, the earnings-related portion of the combined pension is accordingly equal, provided it does not exceed the earnings-related portion of the maximum disability pension applicable when the second of the two pensions emerges, to the greater of:

- 100% of the survivor's own disability pension plus 60% of the regular survivor pension (corresponding to a reduction of the survivor pension from 37.5% to 22.5% of the deceased contributor's retirement pension); and
- 100% of the survivor pension plus 60% of the survivor's regular disability pension.

5. Limit on death benefits

The limit on the death benefit (which continues as a lump sum corresponding to 6 months of a retirement pension) is reduced from 10% of the YMPE, amounting to $3,580 for 1997, to a constant $2,500. This measure, applying to deaths occurring after 1997, is expected to reduce by 77.2% in aggregate death benefits otherwise projected for 2030. This corresponds to a reduction of 0.14 percentage point in the pay-as-you-go rate projected for 2030.

6. Earnings index: averaging the YMPE over 5 instead of 3 years

The earnings index involved in the determination of the initial rate of a pension will be based on the YMPE average over the last 4 and 5 years, instead of the last 3 years, in respect of pensions emerging in 1998 and after 1998, respectively. Such emergences also include the conversion of a disability benefit into a retirement benefit when the disabled contributor reaches age 65. However, the 3-year YMPE average still applies for purposes of determining

- the surviving spouse's pension even if the deceased spouse's retirement pension were to commence after 1997 provided the surviving spouse would be already over age 65 as at 31 December 1997; and
- the death benefit, provided the deceased spouse would as at 31 December 1997 be either at least age 65 or in receipt of a disability pension or of a retirement pension.

This modification is expected to reduce by 3.7% in aggregate retirement, survivor and disability benefits otherwise projected for 2030. This corresponds to a reduction of 0.44 percentage point in the pay-as-you-go rate projected for 2030.

III- Data, Methods and Assumptions

As required by the CPP, an actuarial report prepared in respect of an amending Bill must use the data, methods and assumptions of the most recent actuarial report on the CPP, in this case the fifteenth report as at 31 December 1993.

Therefore, the estimates presented in this report were made using, with appropriate adjustments, the data, methods and assumptions described in Appendix B of the fifteenth actuarial report. This description is not reproduced here. In connection with the plan provisions being modified by the Bill, most of the additional procedures required for an adequate estimate of their financial effect were generally straightforward as they merely involve the replacement of explicit parameters. (For example, the effect of the more stringent eligibility rules for disability benefits, i.e. contributions for at least 4 of the last 6 years at disablement, was estimated using the methodology, described on page 79 of the fifteenth report, which relies on the relevant distinct earnings microsimulation model. Care was taken to account for the larger effect of economic downturns on eligibility.) However, new data and assumptions were required in respect of the strengthening on the disability adjudication rules and the investment of the Fund into a diversified portfolio. These are described in sections A and B below.

A- Administration of disability benefits

The corrective measures to the administration of disability benefits referred to in section II-C-2 above correspond in practice to a change in the plan provisions which is considered to have a material effect on the estimates of the CPP fifteenth report. Although its effect on the disability incidence rates can be assessed only somewhat arbitrarily at this time, it is expected to reduce the CPP aggregate ultimate disability incidence rates from 5.5 to 5.0 per 1000, starting in 1995. The rationale is as follows:

- although the determination of disability inevitably remains a subjective process in many cases, the mere fact of implementing guidelines revised with the explicit objective of tightening the adjudication process would normally be effective in constraining disability costs;
- the new guidelines have been written in plain language with many supporting relevant examples and clear explanations. This should greatly facilitate the comprehension of the revised objectives by the adjudicators; and
- assuming an aggregate disability incidence rate of 5.0 can be considered reasonable and safe as:
    - this level corresponds to the *peak* level experienced in 1986;
    - the overall incidence rate has exceeded the level of 5 only in 1993 and 1994, which is a very short experience base; and
    - 1995 CPP benefit statistics show a material reduction of about one-third in the number of new cases put in pay. Experience has levelled off in this

respect since then.

Assumed durations of disability are not expected to be materially affected by the new guidelines. Therefore, disability termination rates assumed for the fifteenth report were maintained for purposes of this sixteenth report.

B- Return on investments

The CPP Account is made of two components: the Operating Balance, which corresponds in size to the benefit payments expected over the next three months, and the Fund, which represents the excess of all CPP assets over the Operating Balance.

In accordance with the new policy of investing the Fund in a diversified portfolio, the ultimate real interest rate assumed on future net cash flows to the Account is 3.8%. This rate is a constant weighted average of the real unchanged rate of 1.5% assumed on the Operating Balance and of the real rate of 4% which replaces the rate of 2.5% assumed on the Fund in previous actuarial reports.

The long term real rate of interest of 4% on the Fund was assumed taking into account the following factors:

- from 1966 to 1995, the average real yield on the Québec Pension Plan (QPP) account, which has always been invested in a diversified portfolio, is close to 4%;
- As reported in the Canadian Institute of Actuaries' (CIA) annual report on Canadian Economic Statistics, the average real yield over the period of 25 years ending in 1996 on the funds of a sample of the largest private pension plans in Canada is close to 5%, resulting from a nominal yield of about 11.0% reduced by the average increase of about 6% in the Consumer Price Index;
- Using historical results published by the CIA in the Report on Canadian Economic Statistics, the real average yield over the 50-year (43 in the case of mortgages) period ending in 1994 is 4.03% in respect of an hypothetical portfolio invested equally in each of the following five areas: conventional mortgages, long term federal bonds (Government of Canada bonds with a term to maturity of at least 20 years), Government of Canada 91-day Treasury Bills, domestic equities (Canadian common stocks) and non-domestic equities (U.S. common stocks). The assumed real rate of 4% retained for the Fund is therefore deemed realistic but erring on the safe side, especially considering that:
    - replacing federal bonds by provincial bonds in this model portfolio would increase the average yield to the extent that provincial bonds carry a

higher return than federal bonds; and

- the 3-month Treasury Bills, which bear lower returns, would normally be invested for the Operating Balance rather than the Fund.

From a larger perspective, assuming a real yield of 4% on the CPP Fund means that the CPP Investment Board would be expected to achieve investment returns comparable to those of the QPP and of large private pension plans.

C- Effect of economic and demographic developments after 1993

The financial estimates presented in this report could differ to some extent if they had been developed on the basis of a more current review (i.e. until 31 December 1996) of the plan's experience than that incorporated in the previous report as at 31 December 1993. The next actuarial review of the CPP prescribed by the amending Bill is as at 31 December 1997 and would normally be published in the fall of 1998. In the meantime, a preliminary review of the experience to 31 March 1997 was made and indicates that it would not materially alter the results presented in this report.

Indeed, the effect on the required level of the stable contribution rate of the lower than expected contribution income for 1994 to 1996 (which is associated with a slower than expected recovery of the economy) is somewhat offset by the effect of the absence of the expected increase in disability benefits over the same period. The most current review of the 25 years or so of CPP disability experience indicates that the long term disability incidence rates should be assumed at a rate of 4 instead of 5 per thousand of eligible contributors. This lower assumption will most likely be used in the next actuarial report.

IV- Aggregate Valuation Results

A- Main findings

1. Effect of the Bill on the three main CPP financial criteria

The effect of each of the modifications of the amendment Bill on some of the criteria of CPP financial status is indicated in section II above. The purpose of this section is to show the aggregate effect of all modifications on each of the main CPP financial criteria, that is pay-as-you-go rates, contribution rates, contributions, expenditures, investment earnings, Account and Account/Expenditure ratio. The tables of financial projections in section B below accomplish this goal.

Using these detailed projection tables and those of the previous report, the chart below summarizes the effect of the amending Bill on the pay-as-you-go rates, the contribution rates and the Account/expenditure ratios presented in table 1A on page 6 of the previous (fifteenth) report. The chart was designed to capture the following two most critical impacts of the amending Bill on the short-term and the long-term projected financial status of the CPP:

- while the deemed long term stable contribution rate of 13.9% for the existing plan is decreased by 4 percentage points down to 9.9% for the modified plan, the long-term pay-as-you-go rate is projected to decrease somewhat less by about 3 percentage points (from about 14% down to about 11%) as it is not affected by the higher investment earnings resulting from the new investment policy and by the projected higher Account/expenditure ratio; and

- the Account/expenditure ratio of about 2 at the end of 1996 is projected to increase gradually to a level of 4.9 around 2020 and then decrease gradually to 4.3 around 2040, after which time it would remain essentially unchanged until 2075.

Year	Pay-as-you-go rate existing	Pay-as-you-go rate amended	Contribution rate existing	Contribution rate amended	Account/expenditure ratio existing	Account/expenditure ratio amended
1997	8.00	7.83	5.85	6.00	1.97	2.08
1998	8.11	7.83	6.10	6.40	1.81	2.00
1999	8.18	7.83	6.35	7.00	1.66	1.98
2000	8.25	7.80	6.60	7.80	1.52	2.04
2001	8.36	7.85	6.85	8.60	1.39	2.19
2002	8.50	7.90	7.10	9.40	1.27	2.42
2003	8.63	7.95	7.35	9.90	1.15	2.70
2005	8.92	8.07	7.85	9.90	0.93	3.21
2010	9.89	8.60	8.90	9.90	0.45	4.17
2015	11.03	9.32	9.90	9.90	- 0.02	4.70
2020	12.29	10.16	N/A	9.90	N/A	4.87
2025	13.49	10.97	N/A	9.90	N/A	4.76
2030	14.22	11.42	N/A	9.90	N/A	4.56
2040	14.31	11.27	N/A	9.90	N/A	4.32
2050	14.11	10.98	N/A	9.90	N/A	4.36
2075	14.37	11.10	N/A	9.90	N/A	4.42
2100	14.76	11.39	N/A	9.90	N/A	3.91

2. Discussion of full funding

Appendix C of the previous fifteenth actuarial report on the CPP discusses some funding aspects normally relevant to private pension plans. The main criteria covered are the normal cost (computed using the entry age normal cost method), the unfunded liability and internal rates of return. This report now discusses how the above mentioned full funding criteria are affected by the amending Bill.

(a) Entry age normal cost

As indicated on page 100 of the previous report, the annual full cost estimated for the CPP as it exists without the changes encompassed by the amending Bill and provided there were no unfunded liability, is 10.50% of contributory earnings over the contributory period of the cohort of contributors whose age nearest birthday is 18 on 1 January 1994. The corresponding value for 1 January 1997 is 10.56%. With the amending Bill, the rate of 10.56% is reduced to 6.11%. Of the corresponding reduction of 4.45 percentage points in the estimated CPP full cost rate, 3.16 points relates to the change in investment policy, another 0.58 point to the freezing of the YBE, and the balance, 0.71 point, to benefit-related changes.

The 6.11% estimate incorporates all the attributes particular to the CPP: low administration expenses equivalent to 1.3% of total expenditures, the cost advantages of covering the entire workforce, etc.

(b) Internal rates of return

The nominal internal rates of return presented on page 101 of the fifteenth actuarial report had been estimated on the basis of the fourteenth report. They are presented in the table below on the basis of the fifteenth report for both the existing and the amended plans. For convenience purposes, the revised estimates are also presented on a real basis, i.e. net of increases in consumer prices. The chart below illustrates the extent to which the amending Bill would redistribute costs among present and future generations of contributors. For example, while the real internal return for the cohort born in 1948 would be reduced by 0.5 percentage point from 5.4% to 4.9%, that for the cohort to be born in 2012 would be increased by 0.3 percentage point from 1.5% to 1.8%.

Birth	**Nominal return %**		**Real return %**	
year	**existing**	**amended**	**existing**	**amended**
1911	31.2	31.2	22.5	22.5
1929	16.2	16.1	10.2	10.1
1948	9.5	8.9	5.4	4.9
1968	6.4	6.1	2.9	2.5
1988	5.2	5.4	1.6	1.9
2012	5.0	5.4	1.5	1.8

(c) Unfunded Liability

As indicated on page 100 of the fifteenth actuarial report on the CPP, the unfunded liability was $487.5 billion as at 31 December 1993. By 31 December 1996, it had further increased to $587.8 billion. As the Account then amounted to $37.9 billion, the funded ratio corresponded to 6.1%, i.e. 37.9/(37.9+587.8). In other words, the unfunded ratio was 93.9%, i.e. the complement of 6.1%.

The unfunded liability as at 31 December 1996 under the modified plan is estimated at $457.5 billion. The unfunded ratio at the end of 1996 is accordingly decreased from 93.9% to 92.3%, i.e. the complement of 37.9/(37.9+457.5). Compared to $587.8 billion, the modified unfunded liability of $457.5 billion represents a decrease of 22%, of which:

- 19% is due to the higher investment returns assumed in accordance with the new investment policy; and
- the balance of 3% is due to some of the benefit-related changes (e.g. initial benefit rate now based on the YMPE being averaged over the last 5 years instead of the last 3 years) which affect the portion of eventual retirement benefits already accrued at the effective date of the change.

The unfunded liability as at 31 December 1996 is not affected by the accelerated annual contribution rate increases as they start to apply after that date.

If the CPP were fully funded, the Account/expenditure ratio would currently, under the existing plan, be equal to about 33, i.e. the actual 1996 year-end Account/expenditure ratio of 2 times the ratio of the full fund (\$37.9b + \$587.9b) to the actual fund (\$37.9b). Hence, the full Account/expenditure ratio would vary over the years consistent with the demographic and economic fluctuations. Future funded and unfunded ratios can be accurately estimated using the complex CPP valuation actuarial model. However, future values can also be simply and quickly approximated using the following formula (which deems full stabilization of all economic and demographic factors) and the relevant ultimate values and assumptions as a proxy for stabilized conditions:

$$FFBR = \frac{\ln(PGR) - \ln(FCR)}{\ln\left(\frac{1+i}{1+e}\right)}$$

where	FFBR	= full-fund benefit ratio
	PGR	= PAYGO rate
	FCR	= full cost rate (i.e. normal cost)
	i	= annual nominal yield on the fund
	e	= annual nominal increase in employment earnings

Taking 0.1425 for PGR, 0.1050 for FCR, 0.06 for "i" and 0.05 for "e", the above formula gives a value of 32.2 for the Account/expenditure ratio under stabilized full funding conditions. This ultimate stabilized result happens to be very close to the actual result of 33.0 for 1996 which is however expected to decrease to some extent during the baby boomers retirement period (about 2010 to 2040) and come back to close to 32.2 afterwards.

For the modified CPP, the fully funded Account/expenditure ratio would be equal to 25.7 (obtained using in the above formula 11.00% instead of 14.25% for PGR, 6.11% instead of 10,50% for FCR, and 7.43% (i.e. 1.035 times 1.038 minus 1) instead of 6% for "i". As the Account/Expenditure ratio is expected to stabilize around 4.3 after 2040, this means that the projected funded ratio would then be equal to 17%, i.e. 4.3/25.7.

B- Tables of financial projections

Starting with the historical results, this section then presents the tables of long-term financial projections that incorporate the effect of the provisions of the amending Bill on the financial status of the CPP projected as under the previous (fifteenth) actuarial report.

TABLE 1
HISTORICAL RESULTS
(millions of dollars)

Year	PAYGO Rate %	Contribution Rate %	Contributory Earnings	Contributions	Expenditures	Cash Flow	Investment Earnings	Change in Operating Balance	Operating Balance December 31	Change in Fund	December 31 Fund	Securities Redeemed	Securities Purchased	Change in Account	Account at December 31	Account to Expenditure Ratio
1966	0.05	3.60	14,744	531	8	523	5	61	61	463	463	0	463	525	525	54.34
1967	0.06	3.60	17,316	623	10	614	37	-19	42	670	1,134	0	672	651	1,175	48.88
1968	0.13	3.60	19,056	686	24	662	79	26	68	715	1,848	0	711	741	1,916	35.46
1969	0.26	3.60	20,485	737	54	683	128	-2	66	813	2,661	0	809	811	2,727	28.02
1970	0.45	3.60	21,475	773	97	676	193	7	73	863	3,524	0	868	869	3,596	24.07
1971	0.66	3.60	22,663	816	149	666	260	5	78	921	4,445	0	922	927	4,523	21.30
1972	0.88	3.60	24,148	869	212	657	333	21	98	970	5,415	0	961	990	5,513	19.83
1973	1.07	3.60	26,072	939	278	661	406	19	118	1,046	6,461	0	1,046	1,065	6,578	16.80
1974	1.17	3.60	33,429	1,203	392	812	497	65	182	1,244	7,704	0	1,240	1,308	7,887	14.05
1975	1.42	3.60	39,617	1,426	561	865	608	86	269	1,386	9,091	0	1,400	1,472	9,359	11.47
1976	1.80	3.60	45,288	1,630	816	815	746	19	288	1,542	10,632	0	1,519	1,561	10,920	10.48
1977	2.05	3.60	50,782	1,828	1,042	786	889	42	330	1,633	12,265	0	1,656	1,675	12,596	9.72
1978	2.31	3.60	56,176	2,022	1,296	727	1,043	97	427	1,673	13,938	0	1,675	1,770	14,365	9.03
1979	2.47	3.60	64,374	2,317	1,590	727	1,235	47	474	1,915	15,854	0	1,914	1,962	16,328	8.31
1980	2.72	3.60	72,325	2,604	1,965	638	1,467	182	656	1,923	17,777	0	1,923	2,105	18,433	7.64
1981	2.89	3.60	83,566	3,008	2,413	595	1,785	168	824	2,211	19,988	0	2,211	2,379	20,812	7.04
1982	2.91	3.60	101,810	3,665	2,958	707	2,160	142	966	2,725	22,713	0	2,725	2,867	23,679	6.58
1983	3.73	3.60	96,507	3,474	3,598	-124	2,494	90	1,056	2,280	24,992	0	2,280	2,369	26,049	6.22
1984	3.66	3.60	114,386	4,118	4,185	-67	2,829	264	1,320	2,499	27,491	0	2,499	2,763	28,811	5.97
1985	4.31	3.60	111,993	4,032	4,826	-795	3,114	206	1,526	2,114	29,605	0	2,112	2,319	31,130	5.66
1986	4.20	3.60	131,131	4,721	5,503	-782	3,395	134	1,659	2,478	32,084	379	2,859	2,613	33,743	4.73
1987	5.02	3.80	141,927	5,393	7,130	-1,736	3,653	209	1,868	1,708	33,792	646	2,354	1,917	35,660	4.31
1988	5.41	4.00	152,832	6,113	8,272	-2,159	3,885	225	2,093	1,502	35,294	733	2,235	1,727	37,387	3.98
1989	5.89	4.20	159,373	6,694	9,391	-2,698	4,162	331	2,424	1,134	36,428	865	1,999	1,465	38,852	3.72
1990	5.82	4.40	179,290	7,889	10,438	-2,549	4,387	329	2,753	1,508	37,936	779	2,288	1,838	40,689	3.53
1991	6.31	4.60	182,518	8,396	11,518	-3,122	4,476	180	2,933	1,174	39,110	911	2,084	1,353	42,043	3.22
1992	7.07	4.80	185,062	8,883	13,076	-4,193	4,498	-190	2,743	494	39,605	997	1,483	305	42,347	2.97
1993	7.79	5.00	183,329	9,166	14,273	-5,106	4,479	119	2,862	-746	38,858	1,755	1,017	-627	41,720	2.72
1994	8.33	5.20	184,324	9,585	15,362	-5,778	4,404	156	3,018	-1,529	37,329	1,723	193	-1,374	40,346	2.52
1995	7.91	5.40	202,061	10,911	15,986	-5,075	4,411	197	3,215	-861	36,468	2,235	1,379	-664	39,683	2.37
1996	8.71	5.60	192,084	10,757	16,723	-5,966	4,178	35	3,250	-1,824	34,644	2,994	1,207	-1,788	37,894	N/A

TABLE 2
ACCOUNT PROJECTION
(millions of dollars)

Year	PAYGO Rate	Contribution Rate	Contributory Earnings	Contributions	Expenditures	Cash Flow	Investment Earnings	Change In Account	Dec. 31 Account	Yield	Account/ Expenditures Ratio
	%	%	$	$	$	$	$	$	$	%	
1997	7.83	6.00	233,762	14,026	18,297	-4,271	4,275	4	40,132	11.25	2.08
1998	7.83	6.40	246,602	15,783	19,313	-3,530	4,256	725	40,857	11.09	2.00
1999	7.83	7.00	261,397	18,298	20,467	-2,169	4,301	2,132	42,989	10.81	1.98
2000	7.80	7.80	278,731	21,741	21,753	-12	4,446	4,435	47,423	10.34	2.04
2001	7.85	8.60	295,669	25,428	23,213	2,215	4,717	6,931	54,355	9.72	2.19
2002	7.90	9.40	313,580	29,477	24,787	4,690	5,106	9,795	64,150	9.00	2.42
2003	7.95	9.90	332,924	32,959	26,466	6,493	5,651	12,144	76,294	8.38	2.70
2004	8.00	9.90	353,297	34,976	28,272	6,704	6,452	13,156	89,451	8.10	2.96
2005	8.07	9.90	374,187	37,045	30,207	6,838	7,274	14,111	103,562	7.83	3.21
2006	8.15	9.90	395,929	39,197	32,281	6,916	8,224	15,140	118,702	7.68	3.44
2007	8.24	9.90	419,051	41,486	34,547	6,939	9,266	16,205	134,907	7.58	3.64
2008	8.36	9.90	442,948	43,852	37,021	6,831	10,403	17,233	152,140	7.52	3.83
2009	8.47	9.90	468,279	46,360	39,685	6,675	11,610	18,284	170,424	7.47	4.01
2010	8.60	9.90	494,839	48,989	42,533	6,456	12,903	19,359	189,783	7.43	4.17
2011	8.73	9.90	522,133	51,691	45,557	6,134	14,242	20,376	210,160	7.39	4.31
2012	8.86	9.90	550,368	54,486	48,776	5,710	15,682	21,392	231,552	7.36	4.43
2013	9.02	9.90	579,650	57,385	52,263	5,122	17,218	22,340	253,892	7.35	4.54
2014	9.17	9.90	610,429	60,432	55,975	4,457	18,863	23,321	277,213	7.36	4.63
2015	9.32	9.90	642,720	63,629	59,914	3,715	20,571	24,286	301,499	7.37	4.70
2016	9.48	9.90	676,152	66,939	64,093	2,846	22,345	25,191	326,690	7.38	4.77
2017	9.64	9.90	710,594	70,349	68,535	1,814	24,181	25,995	352,685	7.38	4.81
2018	9.81	9.90	746,653	73,919	73,264	655	26,074	26,729	379,414	7.39	4.85
2019	9.98	9.90	784,292	77,645	78,280	-635	28,021	27,386	406,800	7.39	4.87
2020	10.16	9.90	822,975	81,475	83,600	-2,125	30,012	27,887	434,687	7.40	4.87
2021	10.33	9.90	863,797	85,516	89,229	-3,713	32,038	28,325	463,012	7.40	4.87
2022	10.50	9.90	905,866	89,681	95,135	-5,454	34,093	28,639	491,651	7.41	4.85
2023	10.67	9.90	950,243	94,074	101,355	-7,281	36,169	28,888	520,539	7.41	4.83
2024	10.83	9.90	996,119	98,616	107,860	-9,244	38,260	29,016	549,555	7.42	4.80
2025	10.97	9.90	1,044,645	103,420	114,610	-11,190	40,361	29,170	578,725	7.42	4.76
2030	11.42	9.90	1,327,185	131,391	151,560	-20,169	51,125	30,956	728,930	7.43	4.56
2035	11.45	9.90	1,699,007	168,202	194,609	-26,407	63,085	36,677	898,466	7.43	4.40
2040	11.27	9.90	2,182,072	216,025	245,915	-29,890	78,038	48,148	1,113,452	7.43	4.32
2045	11.07	9.90	2,796,739	276,877	309,719	-32,842	98,140	65,298	1,403,620	7.42	4.33
2050	10.98	9.90	3,566,655	353,099	391,583	-38,484	125,180	86,696	1,792,722	7.42	4.36
2055	10.98	9.90	4,531,689	448,637	497,700	-49,063	160,486	111,423	2,298,493	7.42	4.40
2060	11.02	9.90	5,751,270	569,376	633,974	-64,598	205,445	140,846	2,941,105	7.42	4.42
2065	11.05	9.90	7,304,951	723,190	807,395	-84,205	262,256	178,051	3,753,166	7.42	4.43
2070	11.07	9.90	9,287,118	919,425	1,027,807	-108,382	334,224	225,842	4,782,339	7.42	4.43
2075	11.10	9.90	11,798,718	1,168,073	1,309,738	-141,665	425,188	283,524	6,081,247	7.42	4.42
2100	11.39	9.90	38,651,756	3,826,524	4,401,701	-575,177	1,266,691	691,514	18,012,258	7.44	3.91

TABLE 3
PROJECTION OF TOTAL EXPENDITURES
(millions of dollars)

Year	Retirement	Disability Flat-Rate	Disability Earnings-Related	Disability Children	Disability Sub-Total	Survivor Flat-Rate	Survivor Earnings-Related	Survivor Sub-Total	Orphans	Death	Expenses	Grand Total
1997	11,524	1,581	1,709	328	3,617	345	2,097	2,442	217	263	233	18,297
1998	12,195	1,685	1,830	347	3,863	353	2,213	2,566	227	219	244	19,313
1999	12,918	1,794	1,959	366	4,120	363	2,343	2,706	238	227	258	20,467
2000	13,726	1,917	2,101	386	4,404	376	2,487	2,863	251	235	273	21,753
2001	14,646	2,058	2,262	409	4,729	392	2,647	3,039	266	244	289	23,213
2002	15,634	2,213	2,438	434	5,084	409	2,822	3,231	281	253	304	24,787
2003	16,693	2,379	2,628	458	5,465	427	3,003	3,430	295	262	321	26,466
2004	17,843	2,556	2,833	484	5,873	445	3,191	3,636	310	271	339	28,272
2005	19,086	2,746	3,055	510	6,311	465	3,385	3,850	324	280	357	30,207
2006	20,436	2,947	3,290	536	6,773	485	3,585	4,070	338	289	375	32,281
2007	21,944	3,157	3,541	562	7,260	505	3,793	4,298	350	298	396	34,547
2008	23,640	3,372	3,802	586	7,760	526	4,008	4,535	361	308	417	37,021
2009	25,497	3,597	4,074	610	8,281	548	4,231	4,779	372	318	438	39,685
2010	27,498	3,833	4,363	635	8,831	571	4,461	5,032	382	328	461	42,533
2011	29,663	4,066	4,658	661	9,384	595	4,700	5,295	393	338	485	45,557
2012	32,059	4,273	4,930	687	9,889	620	4,949	5,569	403	347	509	48,776
2013	34,695	4,488	5,210	713	10,411	644	5,209	5,853	412	357	534	52,263
2014	37,507	4,719	5,512	739	10,970	670	5,480	6,149	422	368	560	55,975
2015	40,504	4,959	5,830	766	11,555	696	5,763	6,458	431	378	588	59,914
2016	43,705	5,206	6,161	793	12,161	723	6,059	6,782	440	388	617	64,093
2017	47,134	5,460	6,504	821	12,784	751	6,371	7,122	450	398	646	68,535
2018	50,831	5,711	6,849	849	13,409	779	6,699	7,479	459	409	677	73,264
2019	54,805	5,955	7,189	878	14,023	808	7,047	7,854	470	420	709	78,280
2020	59,068	6,194	7,526	908	14,628	837	7,414	8,251	480	431	742	83,600
2021	63,613	6,432	7,866	938	15,236	866	7,804	8,669	492	442	778	89,229
2022	68,447	6,648	8,186	970	15,804	895	8,218	9,113	504	453	813	95,135
2023	73,584	6,853	8,497	1,003	16,354	924	8,661	9,585	517	465	850	101,355
2024	78,976	7,052	8,809	1,039	16,899	953	9,133	10,086	532	477	889	107,860
2025	84,600	7,237	9,111	1,076	17,424	982	9,637	10,619	547	489	931	114,610
2030	115,139	8,155	10,758	1,301	20,214	1,128	12,715	13,843	641	550	1,173	151,560
2035	148,938	9,650	13,414	1,593	24,658	1,292	16,857	18,150	762	612	1,490	194,609
2040	187,904	11,728	17,194	1,946	30,868	1,503	22,161	23,664	909	667	1,903	245,915
2045	235,702	14,554	22,477	2,359	39,390	1,779	28,628	30,408	1,084	708	2,428	309,719
2050	298,421	17,825	28,974	2,842	49,642	2,129	36,287	38,416	1,290	732	3,083	391,583
2055	381,744	21,577	36,879	3,427	61,884	2,545	45,349	47,894	1,534	740	3,906	497,700
2060	490,883	25,779	46,277	4,149	76,205	3,026	56,350	59,376	1,824	741	4,945	633,974
2065	630,099	30,968	58,354	5,034	94,356	3,587	70,170	73,757	2,171	743	6,269	807,395
2070	806,513	37,531	74,206	6,098	117,835	4,258	87,907	92,165	2,583	752	7,958	1,027,807
2075	1,032,033	45,730	94,883	7,364	147,977	5,071	110,721	115,793	3,070	768	10,097	1,309,738
2100	3,547,701	117,210	309,283	18,952	445,445	12,038	355,438	367,476	7,272	838	32,970	4,401,701

TABLE 4
DIFFERENCE BETWEEN THIS REPORT AND THE PREVIOUS REPORT
(millions of dollars)

		Disability				Survivor						
Year	Retirement	Flat-Rate	Earnings-Related	Children	Sub-Total	Flat-Rate	Earnings-Related	Sub-Total	Orphans	Death	Expenses	Grand Total
1997	-1	-130	-155	-34	-320	0	1	1	0	0	0	-319
1998	-9	-177	-207	-45	-428	1	-1	0	0	-60	0	-498
1999	-34	-224	-258	-55	-536	1	-4	-2	0	-70	0	-642
2000	-67	-262	-299	-63	-624	2	-8	-6	0	-82	0	-777
2001	-106	-296	-339	-70	-705	3	-14	-11	0	-96	0	-917
2002	-154	-332	-382	-76	-790	4	-22	-18	1	-112	0	-1,074
2003	-210	-368	-428	-84	-880	5	-32	-27	0	-130	0	-1,248
2004	-277	-407	-477	-90	-975	5	-44	-40	1	-150	0	-1,440
2005	-353	-447	-529	-97	-1,073	6	-59	-53	1	-171	0	-1,651
2006	-440	-487	-584	-104	-1,176	7	-76	-69	1	-195	0	-1,879
2007	-538	-530	-642	-110	-1,283	8	-95	-88	1	-221	0	-2,128
2008	-650	-574	-701	-117	-1,392	8	-118	-109	1	-249	0	-2,399
2009	-776	-618	-764	-123	-1,504	10	-144	-134	1	-280	0	-2,693
2010	-916	-664	-828	-129	-1,620	11	-173	-162	1	-313	0	-3,008
2011	-1,068	-710	-893	-134	-1,738	12	-205	-194	2	-349	0	-3,348
2012	-1,241	-751	-955	-139	-1,845	13	-243	-230	2	-388	0	-3,703
2013	-1,435	-793	-1,018	-144	-1,955	15	-285	-271	2	-430	0	-4,088
2014	-1,643	-836	-1,083	-150	-2,069	16	-331	-316	3	-475	0	-4,500
2015	-1,866	-881	-1,153	-155	-2,188	18	-382	-365	3	-524	0	-4,941
2016	-2,105	-928	-1,225	-160	-2,311	19	-439	-420	3	-577	0	-5,411
2017	-2,364	-974	-1,299	-165	-2,439	20	-500	-480	4	-634	0	-5,912
2018	-2,643	-1,021	-1,373	-171	-2,564	21	-568	-546	3	-695	0	-6,445
2019	-2,944	-1,066	-1,447	-176	-2,688	23	-641	-618	4	-760	0	-7,007
2020	-3,266	-1,109	-1,521	-181	-2,811	25	-720	-695	4	-830	0	-7,598
2021	-3,611	-1,153	-1,594	-187	-2,933	27	-805	-779	5	-906	0	-8,225
2022	-3,980	-1,194	-1,663	-192	-3,049	28	-897	-868	5	-988	0	-8,879
2023	-4,371	-1,231	-1,731	-199	-3,160	30	-994	-964	5	-1,075	0	-9,566
2024	-4,785	-1,268	-1,798	-205	-3,271	31	-1,099	-1,067	6	-1,168	0	-10,284
2025	-5,216	-1,301	-1,863	-212	-3,376	33	-1,210	-1,177	6	-1,268	0	-11,031
2030	-7,572	-1,462	-2,216	-252	-3,931	42	-1,876	-1,834	10	-1,879	0	-15,206
2035	-10,133	-1,716	-2,778	-305	-4,798	50	-2,740	-2,689	13	-2,697	0	-20,305
2040	-13,001	-2,058	-3,554	-367	-5,979	61	-3,825	-3,763	18	-3,736	0	-26,462
2045	-16,418	-2,518	-4,637	-439	-7,595	76	-5,144	-5,067	24	-4,995	0	-34,051
2050	-20,866	-3,058	-5,979	-527	-9,563	96	-6,677	-6,581	31	-6,485	0	-43,465
2055	-26,747	-3,669	-7,606	-632	-11,907	119	-8,402	-8,283	38	-8,259	0	-55,160
2060	-34,432	-4,359	-9,549	-762	-14,670	145	-10,367	-10,222	46	-10,453	0	-69,731
2065	-44,166	-5,211	-12,045	-920	-18,177	175	-12,709	-12,534	57	-13,275	0	-88,095
2070	-56,438	-6,288	-15,326	-1,111	-22,724	210	-15,638	-15,428	70	-16,967	0	-111,486
2075	-72,052	-7,632	-19,615	-1,338	-28,584	252	-19,395	-19,142	84	-21,769	0	-141,464
2100	-246,276	-19,399	-64,262	-3,421	-87,083	613	-60,135	-59,523	209	-72,402	0	-465,076

TABLE 5
PROJECTION OF TOTAL EXPENDITURES
(as a percentage of contributory earnings, i.e., pay-as-you-go rate)

		Disability				Survivor						
Year	Retirement	Flat-Rate	Earnings-Related	Children	Sub-Total	Flat-Rate	Earnings-Related	Sub-Total	Orphans	Death	Expenses	Grand Total
1997	4.93	0.68	0.73	0.14	1.55	0.15	0.90	1.04	0.09	0.11	0.10	7.83
1998	4.95	0.68	0.74	0.14	1.57	0.14	0.90	1.04	0.09	0.09	0.10	7.83
1999	4.94	0.69	0.75	0.14	1.58	0.14	0.90	1.04	0.09	0.09	0.10	7.83
2000	4.92	0.69	0.75	0.14	1.58	0.13	0.89	1.03	0.09	0.08	0.10	7.80
2001	4.95	0.70	0.77	0.14	1.60	0.13	0.90	1.03	0.09	0.08	0.10	7.85
2002	4.99	0.71	0.78	0.14	1.62	0.13	0.90	1.03	0.09	0.08	0.10	7.90
2003	5.01	0.71	0.79	0.14	1.64	0.13	0.90	1.03	0.09	0.08	0.10	7.95
2004	5.05	0.72	0.80	0.14	1.66	0.13	0.90	1.03	0.09	0.08	0.10	8.00
2005	5.10	0.73	0.82	0.14	1.69	0.12	0.90	1.03	0.09	0.07	0.10	8.07
2006	5.16	0.74	0.83	0.14	1.71	0.12	0.91	1.03	0.09	0.07	0.09	8.15
2007	5.24	0.75	0.85	0.13	1.73	0.12	0.91	1.03	0.08	0.07	0.09	8.24
2008	5.34	0.76	0.86	0.13	1.75	0.12	0.90	1.02	0.08	0.07	0.09	8.36
2009	5.44	0.77	0.87	0.13	1.77	0.12	0.90	1.02	0.08	0.07	0.09	8.47
2010	5.56	0.77	0.88	0.13	1.78	0.12	0.90	1.02	0.08	0.07	0.09	8.60
2011	5.68	0.78	0.89	0.13	1.80	0.11	0.90	1.01	0.08	0.06	0.09	8.73
2012	5.83	0.78	0.90	0.12	1.80	0.11	0.90	1.01	0.07	0.06	0.09	8.86
2013	5.99	0.77	0.90	0.12	1.80	0.11	0.90	1.01	0.07	0.06	0.09	9.02
2014	6.14	0.77	0.90	0.12	1.80	0.11	0.90	1.01	0.07	0.06	0.09	9.17
2015	6.30	0.77	0.91	0.12	1.80	0.11	0.90	1.00	0.07	0.06	0.09	9.32
2016	6.46	0.77	0.91	0.12	1.80	0.11	0.90	1.00	0.07	0.06	0.09	9.48
2017	6.63	0.77	0.92	0.12	1.80	0.11	0.90	1.00	0.06	0.06	0.09	9.64
2018	6.81	0.76	0.92	0.11	1.80	0.10	0.90	1.00	0.06	0.05	0.09	9.81
2019	6.99	0.76	0.92	0.11	1.79	0.10	0.90	1.00	0.06	0.05	0.09	9.98
2020	7.18	0.75	0.91	0.11	1.78	0.10	0.90	1.00	0.06	0.05	0.09	10.16
2021	7.36	0.74	0.91	0.11	1.76	0.10	0.90	1.00	0.06	0.05	0.09	10.33
2022	7.56	0.73	0.90	0.11	1.74	0.10	0.91	1.01	0.06	0.05	0.09	10.50
2023	7.74	0.72	0.89	0.11	1.72	0.10	0.91	1.01	0.05	0.05	0.09	10.67
2024	7.93	0.71	0.88	0.10	1.70	0.10	0.92	1.01	0.05	0.05	0.09	10.83
2025	8.10	0.69	0.87	0.10	1.67	0.09	0.92	1.02	0.05	0.05	0.09	10.97
2030	8.68	0.61	0.81	0.10	1.52	0.08	0.96	1.04	0.05	0.04	0.09	11.42
2035	8.77	0.57	0.79	0.09	1.45	0.08	0.99	1.07	0.04	0.04	0.09	11.45
2040	8.61	0.54	0.79	0.09	1.41	0.07	1.02	1.08	0.04	0.03	0.09	11.27
2045	8.43	0.52	0.80	0.08	1.41	0.06	1.02	1.09	0.04	0.03	0.09	11.07
2050	8.37	0.50	0.81	0.08	1.39	0.06	1.02	1.08	0.04	0.02	0.09	10.98
2055	8.42	0.48	0.81	0.08	1.37	0.06	1.00	1.06	0.03	0.02	0.09	10.98
2060	8.54	0.45	0.80	0.07	1.33	0.05	0.98	1.03	0.03	0.01	0.09	11.02
2065	8.63	0.42	0.80	0.07	1.29	0.05	0.96	1.01	0.03	0.01	0.09	11.05
2070	8.68	0.40	0.80	0.07	1.27	0.05	0.95	0.99	0.03	0.01	0.09	11.07
2075	8.75	0.39	0.80	0.06	1.25	0.04	0.94	0.98	0.03	0.01	0.09	11.10
2100	9.18	0.30	0.80	0.05	1.15	0.03	0.92	0.95	0.02	0.00	0.09	11.39

TABLE 6
DIFFERENCE BETWEEN THIS REPORT AND THE PREVIOUS REPORT
(pay-as-you-go rates %)

		Disability				Survivor						
Year	Retirement	Flat-Rate	Earnings-Related	Children	Sub-Total	Flat-Rate	Earnings-Related	Sub-Total	Orphans	Death	Expenses	Grand Total
1997	-0.023	-0.059	-0.070	-0.015	-0.145	-0.001	-0.004	-0.004	0.000	-0.001	0.000	-0.173
1998	-0.048	-0.079	-0.091	-0.020	-0.189	-0.001	-0.008	-0.009	-0.001	-0.025	-0.001	-0.274
1999	-0.078	-0.096	-0.110	-0.023	-0.228	-0.001	-0.013	-0.014	-0.001	-0.028	-0.001	-0.351
2000	-0.128	-0.110	-0.125	-0.026	-0.262	-0.002	-0.022	-0.024	-0.002	-0.032	-0.002	-0.448
2001	-0.156	-0.119	-0.136	-0.028	-0.283	-0.002	-0.026	-0.029	-0.002	-0.035	-0.002	-0.507
2002	-0.204	-0.131	-0.150	-0.029	-0.310	-0.003	-0.035	-0.038	-0.002	-0.039	-0.003	-0.597
2003	-0.251	-0.141	-0.162	-0.031	-0.335	-0.003	-0.043	-0.046	-0.003	-0.043	-0.004	-0.682
2004	-0.296	-0.151	-0.175	-0.032	-0.358	-0.004	-0.051	-0.056	-0.003	-0.048	-0.004	-0.765
2005	-0.341	-0.160	-0.187	-0.034	-0.381	-0.004	-0.060	-0.064	-0.004	-0.051	-0.005	-0.846
2006	-0.403	-0.171	-0.202	-0.035	-0.408	-0.005	-0.070	-0.075	-0.004	-0.056	-0.005	-0.953
2007	-0.447	-0.179	-0.212	-0.036	-0.427	-0.005	-0.078	-0.083	-0.005	-0.060	-0.006	-1.027
2008	-0.491	-0.186	-0.222	-0.036	-0.444	-0.006	-0.085	-0.090	-0.005	-0.064	-0.006	-1.101
2009	-0.552	-0.194	-0.234	-0.037	-0.465	-0.006	-0.095	-0.101	-0.005	-0.069	-0.006	-1.198
2010	-0.611	-0.202	-0.245	-0.038	-0.484	-0.006	-0.104	-0.111	-0.006	-0.073	-0.007	-1.291
2011	-0.653	-0.206	-0.252	-0.037	-0.495	-0.006	-0.111	-0.117	-0.005	-0.077	-0.007	-1.356
2012	-0.714	-0.210	-0.260	-0.037	-0.507	-0.007	-0.120	-0.127	-0.006	-0.081	-0.007	-1.442
2013	-0.775	-0.214	-0.266	-0.037	-0.518	-0.007	-0.129	-0.136	-0.006	-0.086	-0.008	-1.527
2014	-0.849	-0.219	-0.275	-0.038	-0.532	-0.007	-0.140	-0.147	-0.006	-0.090	-0.008	-1.632
2015	-0.904	-0.222	-0.281	-0.037	-0.539	-0.007	-0.148	-0.156	-0.006	-0.095	-0.009	-1.708
2016	-0.958	-0.224	-0.285	-0.037	-0.546	-0.007	-0.157	-0.164	-0.006	-0.099	-0.009	-1.781
2017	-1.026	-0.227	-0.292	-0.037	-0.557	-0.007	-0.167	-0.174	-0.006	-0.104	-0.009	-1.875
2018	-1.093	-0.230	-0.298	-0.037	-0.564	-0.008	-0.176	-0.184	-0.006	-0.108	-0.009	-1.965
2019	-1.158	-0.231	-0.301	-0.037	-0.569	-0.008	-0.186	-0.194	-0.006	-0.113	-0.010	-2.049
2020	-1.221	-0.231	-0.304	-0.036	-0.572	-0.008	-0.195	-0.203	-0.006	-0.118	-0.010	-2.130
2021	-1.282	-0.231	-0.306	-0.036	-0.573	-0.008	-0.204	-0.212	-0.006	-0.122	-0.010	-2.204
2022	-1.355	-0.231	-0.308	-0.036	-0.575	-0.008	-0.214	-0.222	-0.006	-0.127	-0.010	-2.295
2023	-1.423	-0.229	-0.309	-0.036	-0.574	-0.008	-0.224	-0.232	-0.006	-0.132	-0.011	-2.377
2024	-1.489	-0.227	-0.308	-0.036	-0.571	-0.008	-0.234	-0.241	-0.006	-0.137	-0.011	-2.455
2025	-1.548	-0.224	-0.306	-0.035	-0.566	-0.008	-0.242	-0.250	-0.006	-0.142	-0.011	-2.523
2030	-1.785	-0.205	-0.295	-0.034	-0.535	-0.008	-0.286	-0.293	-0.005	-0.166	-0.012	-2.796
2035	-1.906	-0.195	-0.297	-0.034	-0.525	-0.007	-0.323	-0.330	-0.005	-0.186	-0.012	-2.965
2040	-1.947	-0.187	-0.302	-0.032	-0.522	-0.007	-0.350	-0.357	-0.005	-0.201	-0.013	-3.044
2045	-1.957	-0.183	-0.313	-0.031	-0.527	-0.007	-0.367	-0.374	-0.005	-0.210	-0.013	-3.086
2050	-1.988	-0.177	-0.321	-0.030	-0.528	-0.006	-0.376	-0.382	-0.005	-0.214	-0.014	-3.130
2055	-2.034	-0.170	-0.325	-0.028	-0.524	-0.006	-0.375	-0.381	-0.004	-0.214	-0.014	-3.171
2060	-2.088	-0.161	-0.324	-0.027	-0.513	-0.006	-0.369	-0.375	-0.004	-0.213	-0.014	-3.207
2065	-2.130	-0.153	-0.324	-0.026	-0.503	-0.005	-0.361	-0.367	-0.004	-0.213	-0.014	-3.231
2070	-2.160	-0.147	-0.326	-0.025	-0.497	-0.005	-0.355	-0.360	-0.004	-0.215	-0.014	-3.249
2075	-2.188	-0.141	-0.330	-0.024	-0.494	-0.005	-0.350	-0.355	-0.004	-0.217	-0.014	-3.272
2100	-2.329	-0.111	-0.333	-0.019	-0.463	-0.004	-0.341	-0.344	-0.003	-0.220	-0.015	-3.373

V- Actuarial Standards

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

- the data on which the valuation is based are sufficient and reliable for the purpose of the valuation;
- the assumptions used are adequate and appropriate; and
- the methodology employed is consistent with sound actuarial principles.

This report has been prepared and this opinion has been given in accordance with generally accepted actuarial principles and the Recommendations of the Canadian Institute of Actuaries.

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24 September 1997