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CANADA PENSION PLAN

STATUTORY ACTUARIAL REPORT NO. 8

AS AT DECEMBER 31, 1982

Canada

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ACTUARIAL REPORT AS AT DECEMBER 31, 1982

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(as at December 31, 1982)

I. INTRODUCTION

This is the eighth actuarial report since the inception of the plan in 1966. It was prepared pursuant to subsection 116(1) of the Canada Pension Plan, which provides that at least once in every five years a report shall be prepared based on an actuarial examination of the operation of this Act and the state of the Canada Pension Plan Account. The last report pursuant to subsection 116(1) was Statutory Actuarial Report No. 6, as at December 31, 1977, which was tabled in the House of Commons on December 18, 1978.

This report is divided into four sections. Section II presents the main tables of financial projections for the plan; they are based on a single set of assumptions, which differ in a number of areas from those used for purposes of the preceding report. Section III provides a number of auxiliary tables to test the sensitivity of the projections to some of the major assumptions and to demonstrate the effect of certain other specified changes. Section IV contains certain observations and conclusions. The report is followed by three appendices. The main provisions of the Canada Pension Plan are summarized in Appendix A, and the assumptions and procedures underlying the main tables of financial projections are given in Appendix B. Finally, the contribution rate that would be applicable to a "fully funded" system and the development of the accompanying "unfunded actuarial liability", on the basis of various sets of economic assumptions, are contained in Appendix C.

Projections are shown for each year from 1983 to 1992, inclusive, for each of the six quinquennial years from 1995 to 2020 and for the years 2030, 2040, 2050, 2075 and 2100.

The fund projections are dependent not only on the various economic and demographic assumptions but also on the contribution rates assumed to be in effect at any time. The contribution rate has been maintained at 3.6% of contributory earnings (split equally between employers and employees) since the inception of the Plan in 1966. It was expected from the beginning that this rate would be more than sufficient to meet current benefits and expenses for about fifteen years, that eventually it would have to be increased, and

that the size of the required increases in contribution rates would depend on the experience of the Plan, the funding objectives and, of course, any amendments made to the provisions of the Plan.

The projections contained in Section II largely confirm the conclusions of the preceding report. However, as a result of experience and some changes in assumptions, the projected fund accumulations and required contribution rates are somewhat higher in this report. The new projections indicate that the contribution rate would have to rise slowly to reach a level of between 10 and 11% some time after the year 2025. Theoretically, an almost infinite number of scenarios involving increased contribution rates is conceivable, and implications of a number of practical alternatives continue to be studied by federal and provincial officials and others concerned with national pension issues.

As in the preceding report, all the fund projections except for Table 5, are developed on three relatively simple assumptions regarding funding objectives and levels of contribution rates:

FUND A

This fund is based on the assumption that contributions continue at the present statutory rate of 3.6% of contributory earnings, which results in three phases in the development of the fund.

During the initial phase, contributions are greater than the amounts required for payment of benefits and expenses. The resulting excess funds substantially represent the net cash flow to the provinces* which gradually decreases to zero. The fund increases by this excess as well as by investment earnings; however, since investment earnings are funds flowing from the provinces which are returnable to them in the form of new loans, they do not affect the net cash flow. The first phase is

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* The actual net cash flow to the provinces is somewhat less than indicated in this report to the extent that interest paid on the operating balance (three months' expenditures) during a particular year does not cover the required increase in the operating balance.

expected to end in 1985*, when current benefits and expenses become greater than current contributions.

During the second phase, in addition to contributions, an increasing part of the interest earnings of the fund would be required to meet the payment of benefits and expenses. While the fund would continue to grow from the accumulation of any interest not required for current expenditures, the funds available to the provinces in the form of new loans would now be less than the interest payments required from them on the outstanding loans, so that the aggregate net cash flow to the provinces would be negative.

The third phase in the progress of the fund begins about 1994 when current expenditures would become greater than the sum of current interest and current contributions. During this phase, an increasing proportion of the loans would have to be repaid by the provinces in order to meet current expenditures, which would have a substantial impact on provincial cash requirements. The fund would decrease until it became exhausted about 2004.

At the end of the third phase, either the contribution rate would have to be raised at least to the level of the pay-as-you-go (Fund B) contribution rate or new sources of funds would have to be introduced.

FUND B

This fund is identical with Fund A during the initial phase. However, after 1984 the net cash flow to the provinces would not be permitted to be negative; instead, the contribution rate would begin to be increased to a level sufficient to meet current expenditures.

Under this assumption, interest payments by the provinces would not be used for purposes of expenditures and thus would be continually returnable to the provinces in the form of new loans and would result in an ever increasing fund.

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*Contributions were less than expenditures in 1983 because, in contrast to normal transactions, practically all contributions relating to 1982 earnings were received in 1982, resulting in unexpectedly high contributions in 1982 and the contrary in 1983.

FUND C

This fund is identical with Fund A during the first two phases. However, at the end of the second phase the fund would not be permitted to decrease; instead, the contribution rate would begin to be increased to levels such that contributions plus interest earnings would continue to be equal to expenditures on a current basis.

Under this assumption, the loans made to the provinces up to the end of the second phase would be renewable in perpetuity. In contrast to Fund B, interest payments by the provinces would be required for purposes of paying benefits and expenses. However, in real terms the fund and interest payments would gradually become less and less significant.

The question to be settled is how soon and at what pace the contribution rate should begin to rise to its ultimate level. This matter is expected to be resolved fairly soon in the course of federal-provincial negotiations.

II. MAIN TABLES OF FINANCIAL PROJECTIONS

This section contains the following tables:

1 Fund projections (showing also contributions, expenditures and the difference between these two which substantially* represents the net cash flow to the provinces)

2 Specific benefits and expenses

3 Specific benefits and expenses, expressed as percentages of contributory earnings ("pay-as-you-go" contribution rates)

4 Benefits split by major category and expenses, in absolute amounts and expressed as percentages of contributory earnings

The assumptions underlying these projections are described in Appendix B. Some of the principal assumptions are as follows:

Annual increase in average earnings after 1992:	5.0%
Annual increase in Consumer Price Index after 1992:	3.5%
Rate of interest on new bonds after 1991:	6.5%
Total fertility rate after 1999:	2.0
Net annual immigration:	0.32% of population

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* The actual net cash flow to the provinces is somewhat less than indicated in this report to the extent that interest paid on the operating balance (three months' expenditures) during a particular year does not cover the required increase in the operating balance.

TABLE 1

FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS, CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3595	3474	-121	25.7	3.60	3474	-121	25.7	3.60	3474	-121	25.7
1984	4179	4274	96	28.5	3.60	4274	96	28.5	3.60	4274	96	28.5
1985	4787	4724	-64	31.3	3.65	4787	0	31.4	3.60	4724	-64	31.3
1986	5513	5161	-352	34.2	3.85	5513	0	34.6	3.60	5161	-352	34.2
1987	6295	5514	-781	36.8	4.11	6295	0	38.1	3.60	5514	-781	36.8
1988	7132	5854	-1278	39.2	4.39	7132	0	41.9	3.60	5854	-1278	39.2
1989	8041	6298	-1743	41.3	4.60	8041	0	45.9	3.60	6298	-1743	41.3
1990	9011	6742	-2269	43.0	4.81	9011	0	50.3	3.60	6742	-2269	43.0
1991	9981	7220	-2762	44.3	4.98	9981	0	54.9	3.60	7220	-2762	44.3
1992	10990	7684	-3306	45.1	5.15	10990	0	59.8	3.60	7684	-3306	45.1
1995	14237	9179	-5058	44.1	5.58	14237	0	76.5	3.97	10112	-4125	45.3
2000	20891	12375	-8516	26.4	6.08	20891	0	111.4	4.95	17018	-3874	45.3
2005	29749	16663	-13086	-25.3	6.43	29749	0	155.9	5.75	26621	-3128	45.3
2010	43157	22218	-20939	-134.3	6.99	43157	0	214.2	6.52	40252	-2906	45.3
2015	64432	29160	-35272	-349.5	7.95	64432	0	293.4	7.60	61532	-2900	45.3
2020	95083	37899	-57184	-751.9	9.03	95083	0	402.0	8.76	92183	-2900	45.3
2030	192816	63564	-129252	-2647.1	10.92	192816	0	754.7	10.76	189916	-2900	45.3
2040	329080	110133	-218947	-7326.8	10.76	329080	0	1416.6	10.66	326180	-2900	45.3
2050	552671	190082	-362589	-17630.0	10.47	552671	0	2659.1	10.41	549771	-2900	45.3
2075	2170142	729957	-1440184	-125652.6	10.70	2170142	0	12837.3	10.69	2167242	-2900	45.3
2100	8382201	2788060	-5594141	-765625.8	10.82	8382201	0	61974.1	10.82	8379301	-2900	45.3

TABLE 2

BENEFITS AND EXPENSES OF ADMINISTRATION
(IN $ MILLIONS)

CALENDAR YEAR	RETIREMENT PENSIONS	DISABILITY PENSIONS			SURVIVING SPOUSES' PENSIONS		ORPHANS' BENEFITS	DEATH BENEFITS	EXPENSES OF ADMINIS-TRATION	TOTAL
		FLAT RATE	EARNINGS RELATED	CHILDREN'S BENEFITS	FLAT RATE	EARNINGS RELATED				
	(1)	(2A)	(2B)	(2C)	(3A)	(3B)	(4)	(5)	(6)	(7)
1983	2286.6	124.6	296.4	51.5	155.9	412.3	103.6	77.3	87.2	3595.2
1984	2679.1	138.6	338.7	55.5	173.6	483.7	118.0	91.3	100.3	4178.7
1985	3099.4	148.9	379.5	58.5	190.3	558.4	131.2	106.7	114.2	4787.1
1986	3616.0	159.1	425.5	62.3	208.7	643.8	145.9	123.1	128.5	5512.9
1987	4182.3	167.9	471.6	65.8	227.6	736.4	161.2	140.8	141.3	6294.8
1988	4793.3	176.6	518.9	69.1	246.8	836.3	177.0	159.7	154.2	7131.8
1989	5458.9	185.6	566.6	72.3	267.1	946.5	194.0	179.9	170.4	8041.2
1990	6171.3	194.7	614.3	75.3	288.2	1066.5	212.2	201.2	187.3	9010.9
1991	6885.9	207.3	665.3	77.2	308.7	1193.5	221.7	220.8	200.5	9981.2
1992	7627.2	220.7	719.1	78.7	329.7	1328.7	231.5	241.4	213.5	10990.4
1995	9995.5	263.1	892.4	82.6	394.8	1782.2	261.2	310.6	255.0	14237.3
2000	14726.5	357.2	1282.6	104.3	533.7	2765.5	318.0	459.7	343.8	20891.2
2005	20931.7	506.5	1924.9	128.4	706.5	4042.8	388.1	657.6	462.9	29749.3
2010	30838.3	701.5	2833.9	153.8	927.6	5691.4	461.0	932.6	617.2	43157.3
2015	47767.2	903.8	3902.4	184.6	1190.5	7805.6	551.2	1316.7	810.0	64432.1
2020	72941.1	1124.9	5203.1	225.3	1481.0	10551.2	670.4	1833.9	1052.8	95083.1
2030	155764.4	1481.9	7858.9	342.8	2076.9	19012.1	1014.5	3499.1	1765.7	192815.6
2040	266591.7	2177.9	13407.8	505.3	2776.6	32759.4	1487.4	6315.3	3059.3	329080.1
2050	449574.5	3389.7	24263.1	750.3	3903.1	52640.0	2199.3	10671.8	5280.1	552670.9
2075	1806453.0	9029.6	93196.3	2009.2	10118.3	181606.7	5878.4	41584.7	20276.6	2170142.0
2100	7039621.0	23978.9	354963.9	5361.6	27005.3	676759.2	15688.5	161384.2	77446.1	8382201.0

TABLE 3

BENEFITS AND EXPENSES OF ADMINISTRATION
(EXPRESSED AS PERCENTAGES OF CONTRIBUTORY EARNINGS)

CALENDAR YEAR	RETIREMENT PENSIONS	DISABILITY PENSIONS			SURVIVING SPOUSES' PENSIONS		ORPHANS' BENEFITS	DEATH BENEFITS	EXPENSES OF ADMINIS-TRATION	TOTAL
		FLAT RATE	EARNINGS RELATED	CHILDREN'S BENEFITS	FLAT RATE	EARNINGS RELATED				
	(1)	(2A)	(2B)	(2C)	(3A)	(3B)	(4)	(5)	(6)	(7)
1983	2.37	0.13	0.31	0.05	0.16	0.43	0.11	0.08	0.09	3.73
1984	2.26	0.12	0.29	0.05	0.15	0.41	0.10	0.08	0.08	3.52
1985	2.36	0.11	0.29	0.04	0.14	0.43	0.10	0.08	0.09	3.65
1986	2.52	0.11	0.30	0.04	0.14	0.45	0.10	0.09	0.09	3.85
1987	2.73	0.11	0.31	0.04	0.15	0.48	0.11	0.09	0.09	4.11
1988	2.95	0.11	0.32	0.04	0.15	0.51	0.11	0.10	0.09	4.39
1989	3.12	0.11	0.32	0.04	0.16	0.55	0.11	0.10	0.10	4.60
1990	3.30	0.10	0.33	0.04	0.16	0.57	0.11	0.11	0.10	4.81
1991	3.43	0.10	0.33	0.04	0.16	0.60	0.11	0.11	0.10	4.98
1992	3.57	0.10	0.34	0.04	0.16	0.63	0.11	0.11	0.10	5.15
1995	3.92	0.10	0.35	0.03	0.15	0.70	0.10	0.12	0.10	5.58
2000	4.28	0.10	0.37	0.03	0.16	0.81	0.09	0.13	0.10	6.08
2005	4.52	0.11	0.42	0.03	0.16	0.87	0.08	0.14	0.10	6.43
2010	5.00	0.11	0.46	0.02	0.15	0.92	0.07	0.15	0.10	6.99
2015	5.90	0.11	0.48	0.02	0.15	0.97	0.07	0.16	0.10	7.95
2020	6.93	0.11	0.49	0.02	0.15	1.00	0.06	0.17	0.10	9.03
2030	8.82	0.08	0.45	0.02	0.12	1.08	0.06	0.20	0.10	10.92
2040	8.71	0.07	0.44	0.02	0.09	1.07	0.05	0.21	0.10	10.76
2050	8.51	0.06	0.46	0.01	0.08	1.00	0.04	0.20	0.10	10.47
2075	8.91	0.04	0.46	0.01	0.05	0.90	0.03	0.21	0.10	10.70
2100	9.09	0.03	0.46	0.01	0.03	0.87	0.02	0.21	0.10	10.82

TABLE 4

BENEFITS AND EXPENSES OF ADMINISTRATION
(BY MAJOR BENEFIT CATEGORY)

CALENDAR YEAR	IN MILLIONS OF DOLLARS				EXPRESSED AS PERCENTAGES OF CONTRIBUTORY EARNINGS			
	RETIREMENT PENSIONS	DISABILITY PENSIONS*	SURVIVORS' AND DEATH BENEFITS	TOTAL**	RETIREMENT PENSIONS	DISABILITY PENSIONS*	SURVIVORS' AND DEATH BENEFITS	TOTAL**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1983	2287	473	749	3595	2.37	0.49	0.78	3.73
1984	2679	533	867	4179	2.26	0.46	0.73	3.52
1985	3099	587	987	4787	2.36	0.44	0.75	3.65
1986	3616	647	1122	5513	2.52	0.45	0.78	3.85
1987	4182	705	1266	6295	2.73	0.46	0.83	4.11
1988	4793	765	1420	7132	2.95	0.47	0.87	4.39
1989	5459	825	1588	8041	3.12	0.47	0.91	4.60
1990	6171	884	1768	9011	3.30	0.47	0.94	4.81
1991	6886	950	1945	9981	3.43	0.47	0.97	4.98
1992	7627	1019	2131	10990	3.57	0.48	1.00	5.15
1995	9996	1238	2749	14237	3.92	0.49	1.08	5.58
2000	14727	1744	4077	20891	4.28	0.51	1.19	6.08
2005	20932	2560	5795	29749	4.52	0.55	1.25	6.43
2010	30838	3689	8013	43157	5.00	0.60	1.30	6.99
2015	47767	4991	10864	64432	5.90	0.62	1.34	7.95
2020	72941	6553	14537	95083	6.93	0.62	1.38	9.03
2030	155764	9684	25603	192816	8.82	0.55	1.45	10.92
2040	266592	16091	43339	329080	8.71	0.53	1.42	10.76
2050	449575	28403	69414	552671	8.51	0.54	1.31	10.47
2075	1806453	104235	239188	2170142	8.91	0.51	1.18	10.70
2100	7039621	384304	880837	8382201	9.09	0.50	1.14	10.82

* INCLUDES PENSIONS FOR CHILDREN OF DISABLED CONTRIBUTORS
** INCLUDES EXPENSES OF ADMINISTRATION

III. AUXILIARY FUND PROJECTIONS

The following nine tables are based on assumptions or specifications that differ in one or several respects from those underlying the Main Tables (Section II).

The auxiliary tables may be compared with Table 1 in order to examine the effect of the following:

Table No.

5 Three alternative funding scenarios:
(a) Modification of Fund C so as to prevent the fund from being less then estimated expenditures for the following year and
(b) Contribution rates increasing gradually according to two separate stipulated schedules but which also eventually evolve into the Modified Fund C

6 Decrease in yield on new investments from 6.5% to 6%

7 Each of the three Economic Assumptions 1% above those underlying the Main Tables

8 Indexing of flat rate benefits at rate of increase in earnings (5% instead of 3.5% p.a.)

9 No gap between annual rates of increase in earnings and prices (price increases 5% instead of 3.5% p.a.)

10 Change in rate of price increases from 3.5% to 4% (Reduction in gap between annual increases in earnings and prices from 1.5% to 1.0%)

11 Net annual immigration of a constant 75,000 instead of approximately .32% of population

12 Total ultimate fertility rate of 1.7 instead of Main Tables basis (actual experience to 1982 graded into 2.0 after 1999)

13 Combined modifications of Tables 10, 11, and 12 ("high cost" estimate)

TABLE 5

AUXILIARY FUND PROJECTIONS
(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS,
CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		(I) MODIFIED FUND C: NO FUND DECREASE AND MINIMUM EQUAL TO EXPENDITURES OF FOLLOWING YEAR				(II) FUND BASED ON CONTRIBUTION RATE INCREASING BY 0.1% EACH YEAR FROM 1985; MODIFIED FUND C MINIMUM				(III) FUND BASED ON CONTRIBUTION RATE INCREASING BY 0.3% EACH YEAR FROM 1985 UNTIL IT REACHES 7.79%; MODIFIED FUND C MINIMUM			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRIBUTION RATE	CONTRIBUTIONS	CASH FLOW	FUND AT END OF YEAR	CONTRIBUTION RATE	CONTRIBUTIONS	CASH FLOW	FUND AT END OF YEAR	CONTRIBUTION RATE	CONTRIBUTIONS	CASH FLOW	FUND AT END OF YEAR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1983	3595	3.60	3474	-121	25.7	3.60	3474	-121	25.7	3.60	3474	-121	25.7
1984	4179	3.60	4274	95	28.5	3.60	4274	95	28.5	3.60	4274	95	28.5
1985	4787	3.60	4724	-63	31.4	3.70	4855	68	31.5	3.90	5117	330	31.7
1986	5513	3.60	5161	-352	34.2	3.80	5447	-66	34.6	4.20	6021	508	35.5
1987	6295	3.60	5514	-781	36.9	3.90	5973	-322	37.8	4.50	6892	597	39.7
1988	7132	3.60	5854	-1278	39.3	4.00	6504	-628	40.9	4.80	7805	673	44.3
1989	8041	3.60	6298	-1743	41.5	4.10	7173	-868	44.0	5.10	8922	881	49.4
1990	9011	3.60	6742	-2269	43.2	4.20	7865	-1146	47.0	5.40	10113	1102	55.2
1991	9981	3.60	7220	-2761	44.5	4.30	8623	-1358	50.0	5.70	11431	1450	61.6
1992	10990	3.60	7684	-3306	45.4	4.40	9392	-1598	53.0	6.00	12807	1817	68.9
1995	14237	3.97	10112	-4125	45.7	4.70	11984	-2253	62.5	6.90	17594	3357	96.5
2000	20891	4.95	17018	-3873	45.7	5.20	17876	-3015	75.1	7.79	26785	5894	169.4
2005	29749	5.75	26621	-3128	45.7	5.70	26383	-3366	87.6	7.79	36065	6316	271.5
2010	43157	6.75	41656	-1501	46.8	6.20	38264	-4893	97.0	7.79	48088	4931	406.0
2015	64432	8.09	65552	1120	69.8	7.18	58191	-6241	97.6	7.79	63113	-1319	566.5
2020	95083	9.16	96398	1315	102.6	8.91	93786	-1297	102.6	7.79	82027	-13056	732.4
2030	192816	10.87	191941	-875	204.5	10.87	191941	-875	204.5	7.79	137575	-55241	929.7
2040	329080	10.62	324748	-4332	346.1	10.62	324748	-4332	346.1	8.81	269610	-59470	929.8
2050	552671	10.38	548070	-4601	583.9	10.38	548070	-4601	583.9	9.34	493201	-59470	929.8
2075	2170142	10.61	2151032	-19110	2291.8	10.61	2151032	-19110	2291.8	10.61	2151032	-19110	2291.8
2100	8382201	10.73	8308849	-73352	8852.5	10.73	8308849	-73352	8852.5	10.73	8308849	-73352	8852.5

TABLE 6

AUXILIARY FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS, CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRIBUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBUTION RATE	CONTRIBUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBUTION RATE	CONTRIBUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3595	3474	-121	25.7	3.60	3474	-121	25.7	3.60	3474	-121	25.7
1984	4179	4274	96	28.5	3.60	4274	96	28.5	3.60	4274	96	28.5
1985	4787	4724	-64	31.3	3.65	4787	0	31.4	3.60	4724	-64	31.3
1986	5513	5161	-352	34.2	3.85	5513	0	34.6	3.60	5161	-352	34.2
1987	6295	5514	-781	36.8	4.11	6295	0	38.1	3.60	5514	-781	36.8
1988	7132	5854	-1278	39.2	4.39	7132	0	41.9	3.60	5854	-1278	39.2
1989	8041	6298	-1743	41.3	4.60	8041	0	45.9	3.60	6298	-1743	41.3
1990	9011	6742	-2269	43.0	4.81	9011	0	50.3	3.60	6742	-2269	43.0
1991	9981	7220	-2762	44.3	4.98	9981	0	54.9	3.60	7220	-2762	44.3
1992	10990	7684	-3306	45.1	5.15	10990	0	59.8	3.60	7684	-3306	45.1
1995	14237	9179	-5058	44.0	5.58	14237	0	76.3	3.97	10127	-4111	45.3
2000	20891	12375	-8516	26.3	6.08	20891	0	110.2	4.97	17073	-3818	45.3
2005	29749	16663	-13086	-25.4	6.43	29749	0	151.9	5.78	26737	-3012	45.3
2010	43157	22218	-20939	-132.6	6.99	43157	0	204.4	6.55	40443	-2715	45.3
2015	64432	29160	-35272	-341.2	7.95	64432	0	273.7	7.62	61752	-2680	45.3
2020	95083	37899	-57184	-726.8	9.03	95083	0	366.2	8.78	92403	-2680	45.3
2030	192816	63564	-129252	-2510.9	10.92	192816	0	655.8	10.77	190136	-2680	45.3
2040	329080	110133	-218947	-6801.4	10.76	329080	0	1174.5	10.67	326400	-2680	45.3
2050	552671	190082	-362589	-15969.5	10.47	552671	0	2103.4	10.42	549991	-2680	45.3
2075	2170142	729957	-1440184	-106754.0	10.70	2170142	0	9027.3	10.69	2167462	-2680	45.3
2100	8382201	2788060	-5594141	-608038.9	10.82	8382201	0	38743.8	10.82	8379521	-2680	45.3

DIFFERENCES IN ASSUMPTIONS	THIS TABLE	TABLE 1
NEW INVESTMENT YIELD AFTER 1992	6%	6.5%

TABLE 7

AUXILIARY FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS
CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3595	3474	-121	25.7	3.60	3474	-121	25.7	3.60	3474	-121	25.7
1984	4179	4274	96	28.5	3.60	4274	96	28.5	3.60	4274	96	28.5
1985	4787	4724	-64	31.3	3.65	4787	0	31.4	3.60	4724	-64	31.3
1986	5513	5161	-352	34.2	3.85	5513	0	34.6	3.60	5161	-352	34.2
1987	6295	5514	-781	36.8	4.11	6295	0	38.1	3.60	5514	-781	36.8
1988	7132	5854	-1278	39.2	4.39	7132	0	41.9	3.60	5854	-1278	39.2
1989	8041	6298	-1743	41.3	4.60	8041	0	45.9	3.60	6298	-1743	41.3
1990	9011	6742	-2269	43.0	4.81	9011	0	50.3	3.60	6742	-2269	43.0
1991	9981	7220	-2761	44.3	4.98	9981	0	54.9	3.60	7220	-2761	44.3
1992	10990	7684	-3306	45.1	5.15	10990	0	59.8	3.60	7684	-3306	45.1
1995	14489	9454	-5035	44.2	5.52	14489	0	76.7	3.93	10331	-4158	45.4
2000	22307	13348	-8960	25.4	6.02	22307	0	114.0	4.94	18319	-3988	45.4
2005	33344	18863	-14482	-32.3	6.36	33344	0	164.6	5.72	29982	-3363	45.4
2010	50753	26374	-24379	-162.5	6.93	50753	0	235.4	6.48	47463	-3290	45.4
2015	79497	36260	-43237	-436.3	7.89	79497	0	337.7	7.56	76156	-3341	45.4
2020	123044	49423	-73622	-978.4	8.96	123044	0	484.8	8.72	119703	-3341	45.4
2030	274419	91108	-183310	-3771.3	10.84	274419	0	999.2	10.71	271077	-3341	45.4
2040	515033	173572	-341462	-11456.7	10.68	515033	0	2059.5	10.61	511692	-3341	45.4
2050	950825	329342	-621483	-30269.9	10.39	950825	0	4244.6	10.36	947483	-3341	45.4
2075	4730596	1603214	-3127382	-272708.8	10.62	4730596	0	25884.8	10.61	4727254	-3341	45.4
2100	23157936	7760754	-15397182	-2101085.0	10.74	23157936	0	157853.2	10.74	23154592	-3341	45.4

DIFFERENCES IN ASSUMPTIONS	THIS TABLE	TABLE 1
INCREASE IN EARNINGS AFTER 1992	6.0%	5.0%
INCREASE IN PRICES AFTER 1992	4.5%	3.5%
YIELD ON NEW INVESTMENTS AFTER 1992	7.5%	6.5%

TABLE 8

AUXILIARY FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS. OTHER DOLLAR FIGURES IN MILLIONS, CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3595	3474	-121	25.7	3.60	3474	-121	25.7	3.60	3474	-121	25.7
1984	4179	4274	96	28.5	3.60	4274	96	28.5	3.60	4274	96	28.5
1985	4787	4724	-64	31.3	3.65	4787	0	31.4	3.60	4724	-64	31.3
1986	5513	5161	-353	34.2	3.85	5513	0	34.6	3.60	5161	-353	34.2
1987	6296	5514	-783	36.8	4.11	6296	0	38.1	3.60	5514	-783	36.8
1988	7137	5854	-1283	39.2	4.39	7137	0	41.9	3.60	5854	-1283	39.2
1989	8053	6298	-1754	41.3	4.60	8053	0	45.9	3.60	6298	-1754	41.3
1990	9030	6742	-2289	42.9	4.82	9030	0	50.3	3.60	6742	-2289	42.9
1991	10011	7220	-2791	44.2	4.99	10011	0	54.9	3.60	7220	-2791	44.2
1992	11032	7684	-3347	44.9	5.17	11032	0	59.8	3.60	7684	-3347	44.9
1995	14329	9179	-5150	43.7	5.62	14329	0	76.5	4.01	10216	-4113	45.2
2000	21118	12375	-8743	24.9	6.14	21118	0	111.4	5.02	17257	-3862	45.2
2005	30200	16663	-13537	-29.4	6.52	30200	0	155.9	5.85	27083	-3116	45.2
2010	43952	22218	-21734	-143.5	7.12	43952	0	214.2	6.65	41059	-2894	45.2
2015	65721	29160	-36561	-368.3	8.11	65721	0	293.4	7.76	62833	-2888	45.2
2020	97058	37899	-59159	-787.2	9.22	97058	0	402.0	8.95	94170	-2888	45.2
2030	196778	63564	-133214	-2753.2	11.14	196778	0	754.7	10.98	193890	-2888	45.2
2040	336620	110133	-226487	-7602.1	11.00	336620	0	1416.6	10.91	333732	-2888	45.2
2050	567093	190082	-377011	-18292.3	10.74	567093	0	2659.1	10.69	564205	-2888	45.2
2075	2236394	729957	-1506436	-130581.9	11.03	2236394	0	12837.3	11.02	2233506	-2888	45.2
2100	8666324	2788060	-5878264	-797107.9	11.19	8666324	0	61974.1	11.19	8663436	-2888	45.2

DIFFERENCES IN ASSUMPTIONS

	THIS TABLE	TABLE 1
INDEXING OF FLAT-RATE BENEFITS AFTER 1984	5% AFTER 1992 (RATE OF EARNINGS INCREASES)	3.5% AFTER 1992

TABLE 9

AUXILIARY FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS,
CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3596	3474	-122	25.7	3.60	3474	-122	25.7	3.60	3474	-122	25.7
1984	4179	4274	95	28.5	3.60	4274	95	28.5	3.60	4274	95	28.5
1985	4787	4724	-64	31.3	3.65	4787	0	31.4	3.60	4724	-64	31.3
1986	5519	5161	-359	34.2	3.85	5519	0	34.6	3.60	5161	-359	34.2
1987	6313	5514	-799	36.8	4.12	6313	0	38.1	3.60	5514	-799	36.8
1988	7184	5854	-1330	39.1	4.42	7184	0	41.9	3.60	5854	-1330	39.1
1989	8155	6298	-1857	41.1	4.66	8155	0	45.9	3.60	6298	-1857	41.1
1990	9207	6742	-2465	42.6	4.92	9207	0	50.3	3.60	6742	-2465	42.6
1991	10276	7220	-3056	43.5	5.12	10276	0	54.9	3.60	7220	-3056	43.5
1992	11406	7684	-3721	43.8	5.34	11406	0	59.8	3.60	7684	-3721	43.8
1995	15178	9179	-5999	40.2	5.95	15178	0	76.5	4.37	11150	-4028	43.8
2000	23107	12375	-10732	11.4	6.72	23107	0	111.4	5.62	19331	-3776	43.8
2005	33759	16663	-17096	-65.8	7.29	33759	0	155.9	6.64	30728	-3031	43.8
2010	49629	22218	-27411	-220.8	8.04	49629	0	214.2	7.59	46819	-2810	43.8
2015	74391	29160	-45231	-516.4	9.18	74391	0	293.4	8.84	71586	-2805	43.8
2020	110051	37899	-72152	-1053.9	10.45	110051	0	402.0	10.19	107246	-2805	43.8
2030	225443	63564	-161878	-3525.7	12.77	225443	0	754.6	12.61	222638	-2805	43.8
2040	393231	110133	-283097	-9622.6	12.85	393231	0	1416.5	12.76	390426	-2805	43.8
2050	664615	190082	-474533	-23122.9	12.59	664615	0	2659.0	12.53	661810	-2805	43.8
2075	2610956	729957	-1880998	-164409.2	12.88	2610956	0	12836.6	12.86	2608151	-2805	43.8
2100	10119672	2788060	-7331612	-1001546.4	13.07	10119672	0	61970.4	13.06	10116867	-2805	43.8

DIFFERENCES IN ASSUMPTIONS	THIS TABLE	TABLE 1
INDEXING OF ALL BENEFITS IN PAYMENT AFTER 1984	5% AFTER 1992 (RATE OF EARNINGS INCREASES)	3.5% AFTER 1992

TABLE 10

AUXILIARY FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS,
CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRIBUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBUTION RATE	CONTRIBUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBUTION RATE	CONTRIBUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3595	3474	-121	25.7	3.60	3474	-121	25.7	3.60	3474	-121	25.7
1984	4179	4274	96	28.5	3.60	4274	96	28.5	3.60	4274	96	28.5
1985	4787	4724	-64	31.3	3.65	4787	0	31.4	3.60	4724	-64	31.3
1986	5513	5161	-352	34.2	3.85	5513	0	34.6	3.60	5161	-352	34.2
1987	6295	5514	-781	36.8	4.11	6295	0	38.1	3.60	5514	-781	36.8
1988	7132	5854	-1278	39.2	4.39	7132	0	41.9	3.60	5854	-1278	39.2
1989	8041	6298	-1743	41.3	4.60	8041	0	45.9	3.60	6298	-1743	41.3
1990	9011	6742	-2269	43.0	4.81	9011	0	50.3	3.60	6742	-2269	43.0
1991	9984	7220	-2764	44.3	4.98	9984	0	54.9	3.60	7220	-2764	44.3
1992	10995	7684	-3311	45.1	5.15	10995	0	59.8	3.60	7684	-3311	45.1
1995	14357	9179	-5177	43.9	5.63	14357	0	76.5	4.01	10232	-4124	45.3
2000	21417	12375	-9042	24.1	6.23	21417	0	111.4	5.10	17544	-3873	45.3
2005	30843	16663	-14180	-33.4	6.66	30843	0	155.9	5.99	27716	-3127	45.3
2010	45024	22218	-22806	-154.2	7.30	45024	0	214.2	6.82	42119	-2905	45.3
2015	67385	29160	-38225	-391.0	8.32	67385	0	293.4	7.96	64487	-2899	45.3
2020	99600	37899	-61700	-830.7	9.46	99600	0	402.0	9.19	96701	-2899	45.3
2030	202710	63564	-139146	-2889.5	11.48	202710	0	754.7	11.32	199812	-2899	45.3
2040	348360	110133	-238226	-7977.1	11.39	348360	0	1416.6	11.29	345461	-2899	45.3
2050	585953	190082	-395871	-19204.2	11.10	585953	0	2659.1	11.04	583054	-2899	45.3
2075	2299187	729957	-1569229	-136863.7	11.34	2299187	0	12837.3	11.32	2296288	-2899	45.3
2100	8881273	2788060	-6093213	-833907.4	11.47	8881273	0	61974.1	11.46	8878374	-2899	45.3

DIFFERENCES IN ASSUMPTIONS	THIS TABLE	TABLE 1
INCREASES IN PRICES AFTER 1992	4%	3.5%

TABLE 11

AUXILIARY FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS, CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3594	3474	-120	25.7	3.60	3474	-120	25.7	3.60	3474	-120	25.7
1984	4177	4270	92	28.5	3.60	4270	92	28.5	3.60	4270	92	28.5
1985	4785	4717	-68	31.3	3.65	4785	0	31.4	3.60	4717	-68	31.3
1986	5510	5152	-358	34.2	3.85	5510	0	34.6	3.60	5152	-358	34.2
1987	6290	5502	-788	36.8	4.12	6290	0	38.1	3.60	5502	-788	36.8
1988	7125	5839	-1286	39.2	4.39	7125	0	41.9	3.60	5839	-1286	39.2
1989	8032	6280	-1752	41.2	4.60	8032	0	45.9	3.60	6280	-1752	41.2
1990	8999	6719	-2280	42.9	4.82	8999	0	50.3	3.60	6719	-2280	42.9
1991	9967	7192	-2774	44.2	4.99	9967	0	54.9	3.60	7192	-2774	44.2
1992	10972	7651	-3321	45.0	5.16	10972	0	59.8	3.60	7651	-3321	45.0
1995	14204	9123	-5081	43.9	5.60	14204	0	76.5	3.98	10087	-4117	45.2
2000	20812	12253	-8559	25.9	6.11	20812	0	111.4	4.98	16947	-3865	45.2
2005	29584	16421	-13163	-26.3	6.49	29584	0	155.9	5.80	26464	-3120	45.2
2010	42844	21774	-21070	-136.3	7.08	42844	0	214.1	6.60	39946	-2898	45.2
2015	63867	28384	-35483	-353.2	8.10	63867	0	293.4	7.73	60975	-2892	45.2
2020	94082	36595	-57487	-758.4	9.26	94082	0	402.0	8.97	91190	-2892	45.2
2030	189701	60216	-129485	-2663.8	11.34	189701	0	754.6	11.17	186809	-2892	45.2
2040	320034	102329	-217706	-7354.0	11.26	320034	0	1416.5	11.16	317142	-2892	45.2
2050	528952	172967	-355985	-17633.9	11.01	528952	0	2658.9	10.95	526060	-2892	45.2
2075	1978055	627357	-1350698	-124095.2	11.35	1978055	0	12836.2	11.33	1975163	-2892	45.2
2100	7224244	2252216	-4972028	-744406.0	11.55	7224244	0	61968.8	11.54	7221352	-2892	45.2

DIFFERENCES IN ASSUMPTIONS	THIS TABLE	TABLE 1
NET IMMIGRATION P.A.	75,000	0.32% OF POPULATION

TABLE 12

AUXILIARY FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS,
CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3595	3474	-121	25.7	3.60	3474	-121	25.7	3.60	3474	-121	25.7
1984	4179	4274	96	28.5	3.60	4274	96	28.5	3.60	4274	96	28.5
1985	4787	4724	-63	31.3	3.65	4787	0	31.4	3.60	4724	-63	31.3
1986	5513	5161	-352	34.2	3.85	5513	0	34.6	3.60	5161	-352	34.2
1987	6295	5514	-781	36.8	4.11	6295	0	38.1	3.60	5514	-781	36.8
1988	7131	5854	-1278	39.2	4.39	7131	0	41.9	3.60	5854	-1278	39.2
1989	8040	6298	-1742	41.3	4.60	8040	0	45.9	3.60	6298	-1742	41.3
1990	9010	6742	-2268	43.0	4.81	9010	0	50.3	3.60	6742	-2268	43.0
1991	9980	7220	-2760	44.3	4.98	9980	0	54.9	3.60	7220	-2760	44.3
1992	10988	7684	-3304	45.1	5.15	10988	0	59.8	3.60	7684	-3304	45.1
1995	14232	9179	-5053	44.1	5.58	14232	0	76.5	3.96	10106	-4126	45.3
2000	20874	12375	-8498	26.5	6.07	20874	0	111.4	4.95	16999	-3874	45.3
2005	29708	16644	-13064	-25.0	6.43	29708	0	155.9	5.75	26579	-3129	45.3
2010	43085	22090	-20995	-133.9	7.02	43085	0	214.2	6.55	40178	-2906	45.3
2015	64317	28737	-35580	-350.0	8.06	64317	0	293.4	7.69	61417	-2900	45.3
2020	94908	36871	-58036	-755.9	9.27	94908	0	402.0	8.98	92007	-2900	45.3
2030	192370	59816	-132554	-2680.6	11.58	192370	0	754.7	11.40	189469	-2900	45.3
2040	327810	99571	-228239	-7470.2	11.85	327810	0	1416.6	11.75	324910	-2900	45.3
2050	547763	164269	-383494	-18101.1	12.00	547763	0	2659.1	11.94	544863	-2900	45.3
2075	1955863	574870	-1380993	-128490.8	12.25	1955863	0	12837.3	12.23	1952962	-2900	45.3
2100	6872490	2035817	-4836673	-764965.4	12.15	6872490	0	61974.1	12.15	6869589	-2900	45.3

DIFFERENCES IN ASSUMPTIONS	THIS TABLE	TABLE 1
TOTAL FERTILITY RATE	1.7	ACTUAL 1982 EXPERIENCE GRADED INTO 2.0 AFTER 1999

TABLE 13

AUXILIARY FUND PROJECTIONS

(FUND IN BILLIONS OF DOLLARS, OTHER DOLLAR FIGURES IN MILLIONS, CONTRIBUTION RATE AS PERCENT OF CONTRIBUTORY EARNINGS)

		FUND A			FUND B				FUND C			
		3.6% CONTRIBUTION RATE			CASH FLOW TO PROVINCES NOT NEGATIVE AFTER 1984				NEGATIVE CASH FLOW TO PROVINCES DECREASES UNTIL EQUAL TO INTEREST ON FUND			
CALENDAR YEAR	BENEFITS AND EXPENSES	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR	CONTRIBU-TION RATE	CONTRI-BUTIONS	CASH FLOW TO PROVINCES	FUND AT END OF YEAR
	(1) $	(2) $	(3) $	(4) $	(5) %	(6) $	(7) $	(8) $	(9) %	(10) $	(11) $	(12) $
1983	3594	3474	-120	25.7	3.60	3474	-120	25.7	3.60	3474	-120	25.7
1984	4177	4270	92	28.5	3.60	4270	92	28.5	3.60	4270	92	28.5
1985	4785	4717	-68	31.3	3.65	4785	0	31.4	3.60	4717	-68	31.3
1986	5509	5152	-358	34.2	3.85	5509	0	34.6	3.60	5152	-358	34.2
1987	6290	5502	-788	36.8	4.12	6290	0	38.1	3.60	5502	-788	36.8
1988	7125	5839	-1286	39.2	4.39	7125	0	41.9	3.60	5839	-1286	39.2
1989	8032	6280	-1752	41.2	4.60	8032	0	45.9	3.60	6280	-1752	41.2
1990	8998	6719	-2279	42.9	4.82	8998	0	50.3	3.60	6719	-2279	42.9
1991	9968	7192	-2775	44.2	4.99	9968	0	54.9	3.60	7192	-2775	44.2
1992	10975	7651	-3324	45.0	5.16	10975	0	59.8	3.60	7651	-3324	45.0
1995	14317	9123	-5194	43.7	5.65	14317	0	76.5	4.03	10201	-4117	45.2
2000	21318	12253	-9065	23.8	6.26	21318	0	111.4	5.13	17453	-3865	45.2
2005	30630	16403	-14228	-34.1	6.72	30630	0	155.9	6.04	27511	-3120	45.2
2010	44622	21646	-22976	-155.7	7.42	44622	0	214.1	6.94	41724	-2898	45.2
2015	66674	27964	-38711	-395.0	8.58	66674	0	293.4	8.21	63782	-2892	45.2
2020	98366	35578	-62787	-840.8	9.95	98366	0	402.0	9.66	95474	-2892	45.2
2030	198970	56537	-142433	-2936.8	12.67	198970	0	754.6	12.49	196078	-2892	45.2
2040	337516	92031	-245485	-8135.7	13.20	337516	0	1416.5	13.09	334625	-2892	45.2
2050	555852	147994	-407858	-19637.4	13.52	555852	0	2658.9	13.45	552960	-2892	45.2
2075	1877502	481285	-1396217	-137488.6	14.04	1877502	0	12836.2	14.02	1874610	-2892	45.2
2100	6140294	1566728	-4573566	-805425.9	14.11	6140294	0	61968.8	14.10	6137402	-2892	45.2

DIFFERENCES IN ASSUMPTIONS	THIS TABLE	TABLE 1
INCREASES IN PRICES	4.0%	3.5%
NET IMMIGRATION P.A.	75,000	0.32% OF POPULATION
TOTAL FERTILITY RATE	1.7	ACTUAL 1982 GRADED INTO 2.0 AFTER 1999

IV. OBSERVATIONS AND CONCLUSIONS

1. If the Canada Pension Plan is to be operated into the indefinite future in the manner contemplated at its inception, the contribution rate will have to be increased grdually, beginning at the latest about 1994, as was envisaged at the outset. As noted in the introduction, the timing and size of the increases will depend on the experience of the plan and the funding objectives, as well as on future amendments to benefit provisions; this matter is expected to be resolved fairly soon in the course of federal-provincial negotiations.

2. Our projections indicate that the Plan could probably operate without an increase in the contribution rate until about the year 2004. This scenario would require the provinces to repay total accumulated loans of over $45 billion, beginning in 1994, at a rate that would be equivalent to about 0.6% of contributory earnings by 1996 and about 2.5% by 2003. Delaying an increase in the contribution rate in this way until the last possible moment, of course, would render impossible the introduction of a series of relatively smooth gradual increases in the contribution rate. Under this financing arrangement, the first projected required increase would be from 3.6% in 2003 to 6.1% in 2004.

3. If it were considered desirable to prevent the accumulated fund from decreasing and thus avoid having the provinces repay the borrowed funds, it appears from Table 1 that as a minimum the contribution rate would have to increase as shown for Fund C; the rate for selected years would be as follows:

Year	Percentage of Contributory Earnings Required to Prevent Decline in Fund
1994	3.73
1995	3.97
1996	4.19
1997	4.40
1998	4.59
1999	4.77
2000	4.95
2005	5.75
2010	6.52
2020	8.76
2030	10.76
2040	10.66
2050	10.41
2075	10.69
2100	10.82

Differences between actual experience and the underlying assumptions would, of course, result in deviations from the above table. Some of these are highlighted below. However, it is important to note that the contribution rates in the above table are practically independent of the level of inflation, provided the gap between increases in earnings and increases in the Consumer Price Index (a measure of the real rate of increase in earnings) remains as assumed; comparing Table 1 with Table 7 reveals that under such circumstances a somewhat higher level of inflation results in slightly lower contribution rates. It should be added that, in practice, the long-term contribution rates would have to be somewhat higher than shown above in order to maintain a meaningful contingency fund (see Part I of Table 5).

4. The projected contribution rates in the Main Tables of this report are higher in the long term (by about 2% of contributory earnings by 2035) than those in the Main tables of the last preceding full actuarial report (No.6). About 15% of this increase is attributable to the introduction of the child rearing drop-out provision. The remainder is due mainly to changes in four key assumptions. Firstly, the assumed gap between rates of increases in earnings and prices was reduced from 2% to 1.5%. Secondly, the assumed ultimate fertility rate was reduced from 2.112 for 1985 and later to 2.0 for 2000 and later. Thirdly, mortality rates are projected to decline to somewhat lower ultimate levels. Fourthly, net immigration was assumed to be at a level of about .32% rather than .465% of population.

5. Table 5 was included in order to illustrate the fund accumulations and cash flows that would materialize under three specific conditions: (a) if the Fund C conditions were modified to provide a minimum fund equal to one year's expenditures, and (b) if, starting in 1985, the contribution rate were increased annually (i) by 0.1% or (ii) by 0.3% of contributory earnings until the full cost rate of 7.79% (see Appendix C) is attained but subject also to the conditions of the Modified Fund C.

(a) The Modified Fund C is identical with Fund C until 2010 when the contribution rate begins to rise a little faster in order to provide the minimum fund, but by 2030 when it reaches its maximum level for the first time the contribution rate is again close to that of Fund C. However, by that time the Fund is more than four times as large as Fund C.

(b)(i) If the contribution rate were increased by 0.1% of contributory earnings beginning in 1985, a fund about 2.2 times Fund C would accumulate by 2011; from 2012 until 2019 the contribution rate would have to rise by slightly more than 0.1% (passing the full cost rate of 7.79% in 2018) in order to prevent the fund from decreasing; from 2020 until 2028 the rise would be still steeper in order to provide the minimum fund. Starting in 2021 the rate would be identical with that of Modified Fund C.

(b)(ii) If the contribution rate were increased each year beginning in 1985 by 0.3% of contributory earnings, a fund about 2.1 times Fund C would accumulate by 1995; from 1998 until 2032 contributions would be at the full cost rate of 7.79%; after that the contribution rate would have to rise again slowly to prevent the fund from decreasing; the contribution rate would reach its ultimate level about 2060 from which time it would be identical with that of Modified Fund C.

6. The Canada Pension Plan provides that funds in excess of estimated expenditures for the ensuing three months shall be available for the purchase of securities of the provinces. The term to maturity of the securities is 20 years or such lesser term as may be fixed by the Minister of Finance on the recommendation of the Chief Actuary when he deems it necessary in order to meet any payments that will be required. As noted above, in the event of contributions continuing as long as possible at the initial rate, the fund could be expected to be exhausted by the year 2004. In such case, some of the securities already issued would have to be redeemed before maturity which the Minister of Finance may do after giving notice of not less than six months. However, since any schedule of contribution rates that will be adopted in the near future following federal-provincial negotiations would likely provide for a reasonable contingency fund and at the very least would likely prevent the fund from declining, there would seem to be little justification for shortening the terms of the securities.

7. Comparing Table 1 with Table 6 confirms the otherwise obvious fact that the rate of interest affects the contribution rate only to the extent that interest earnings are applied to the provision of benefits. The lower interest rate applicable to Table 6, of course, results in somewhat lower fund accumulations and smaller interest payments from the provinces. However, by definition, the interest rate cannot affect the contribution rate in the case of Fund B; it affects the contribution rate slightly in the case of Fund C, where it also affects the net cash flow from the provinces, since in this case interest earnings do not flow back to the provinces in the form of new loans. The effect of the interest rate on the contribution rate in an actuarially funded system is shown in Appendix C.

8. Table 8 was included to demonstrate the effect of maintaining flat-rate benefits in line with average earnings rather than with the Consumer Price Index. Adopting a different indexing formula for flat-rate benefits would be complex and difficult to explain. However, it must be recognized that over long periods of time, the income replacement value of flat-rate benefits is likely to be seriously eroded as long as earnings continue to increase faster than prices and it is quite possible that flat-rate benefits would be increased arbitrarily from time to time to compensate for such erosion.

9. Table 9 is based on the assumption that the rates of increase in prices are equal to the rates of increase in earnings (5% rather than 3.5% p.a. after 1992). Of course, the same effect would be produced either if the gap between these two economic factors were eliminated or if all benefits in payment were increased in accordance with an index of average earnings. In this scenario costs are seen to be higher by about .6% of contributory earnings by 2000 and about 2% from 2035.

10. As detailed in Appendix B, the economic assumptions underlying the Main Tables imply a gap of 1.5 percentage points between increases in earnings and increases in the Consumer Price Index. Comparing Table 1 with Table 10 indicates the relative effect of a gap of 1.0% instead of 1.5%; for example, increases in the contribution rate would tend to be required slightly earlier and the required level of contribution rates would have to be slightly higher (about 0.6% of contributory earnings higher by the year 2035). On the other hand, the reverse would be true if the gap were to average above 1.5% (or above 2% as it did over the last fifty years).

11. The migration assumptions underlying the Main Tables, as described in Appendix B, imply a nearly constant ratio of net immigrants to population of 0.32%. Comparing Table 1 with Table 11 indicates the effect of a constant level of net immigrants of 75,000 p.a. instead of the said constant ratio. A constant number of net immigrants, of course, results not only in a smaller total population but in a ratio of net immigrants to current population which

declines to about 0.20% by the year 2050 and 0.18 % by 2100. This would result in slightly more rapid increases in the required contribution rates, leading to an increase in costs of 0.7% of contributory earnings by 2080.

12. As noted in Appendix B, the population projections underlying the main tables are based on a total ultimate (after 1999) fertility rate of 2.0. In order to test the effect of a more pessimistic assumption, Table 1 may be compared with Table 12 which is based on a projected total fertility rate of 1.7, i.e., a continuation of the historically low rates experienced over the last few years. Fertility rates at the lower level would result in required contribution rates gradually higher than indicated in the Main Tables, beginning in about twenty-four years and producing increased costs of about 1.1% of contributory earnings by 2040 rising to 1.7% by 2060 and declining to 1.3% by 2100.

13. Table 13 was included in an attempt to show what might be considered a high cost estimate and is based on the combination of the variations in assumptions described in the three preceding paragraphs. In other words, Table 13 assumes (a) a gap between increases in earnings and increases in the Consumer Price Index of 1.0% rather than 1.5%, (b) a constant level of net immigration of 75,000 instead of increasing in line with current population and (c) a projected total fertility rate of 1.7 rather than an ultimate rate of 2.0. Comparing Table 13 with Table 1 indicates that if experience in these three areas were to be less favourable than assumed for purposes of the Main Tables, to the extent stipulated here, the required increases in contribution rates would be greater and the additional cost produced would be about 0.6% of contributory earnings by 2015, rising to 2.1% by 2035 and, to about 3.3% from 2055.

14. Table 13 presents the progress of the plan under conditions substantially less favourable than we would expect. Among other things, the demographic assumptions underlying Table 13 result in a working age population which begins to decrease about 2015. However, not only may one or more of the three factors combining to produce the results in Table 13 emerge as even more favourable than assumed for the Main Tables, but the experience in some other area may do so. For example, for purposes of this report it was deemed prudent to use mortality rates based on the assumption of substantially more improvement until year 2050 than in the previous report. It is quite conceivable that the improvement in mortality rates for significant age ranges will not be as great as assumed which would tend to reduce costs.

15. Highlights of Projections

	Year	Contribution Rate (Percent of contributory earnings)	Fund at Year End ($ billions)	Ratio of Fund to Next Year's Expenditures
Fund B				
(Contribution rate increased as required to meet expenditures without recourse to interest earnings)	1985	3.65	31.4	5.7
	1990	4.81	50.3	5.0
	2000	6.08	111.4	5.0
	2015	7.95	293.4	4.2
	2020	9.03	402.0	3.9
	2030	10.92	754.7	3.7
	2040	10.76	1416.6	4.1
	2050	10.47	2659.1	4.5
	2100	10.82	61974.1	7.0
Fund C				
(Contribution rate increased as required to prevent fund from decreasing)	1985	3.60	31.3	5.7
	1990	3.60	43.0	4.3
	2000	4.95	45.3	2.0
	2015	7.60	45.3	0.66
	2020	8.76	45.3	0.45
	2030	10.76	45.3	0.22
	2040	10.66	45.3	0.13
	2050	10.41	45.3	0.08
	2100	10.82	45.3	0.01

16. The gradually increasing costs, expressed as percentages of contributory earnings, that are exhibited in the projections suggest that the most orderly way of guiding the Canada Pension Plan Investment Fund toward an agreed level would be to raise contribution rates gradually over a substantial number of years. If it were desired simply to prevent the fund from declining, the first increase in the contribution rate would likely not be required until about 1994. The contribution rate has important implications for the financial requirements of the provinces and, as noted earlier, this matter is expected to be resolved fairly soon through federal-provincial negotiations.

Respectfully submitted,

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Appendix A

MAIN PROVISIONS OF THE PLAN

1. Coverage and Contributions

In general, the Canada Pension Plan which came into force on January 1, 1966, applies to virtually all paid members of the labour force in Canada (both employees and self-employed persons) between the ages of 18 and 70, other than persons in the province of Quebec who are covered by the Quebec Pension Plan*. The main exceptions are:

(a) persons with earnings less than the "Year's Basic Exception",
(b) persons to whom a retirement or disability pension is payable pursuant to the Act, and
(c) members of certain religious sects.

For those who are eligible, contributions in any year are required in respect of all earnings between the "Year's Basic Exemption" and the "Year's Maximum Pensionable Earnings".

The rate of contribution as respects earnings subject to contributions which has been in effect since the inception of the Plan is 1.8% of salary and wages for employees and a like amount for their employers and 3.6% of self-employed earnings.

2. Definition of Terms Relating to Earnings

Five terms relating to the earnings of contributors that are used frequently in this report are defined and described below.

Year's Maximum Pensionable Earnings (YMPE)

"Year's Maximum Pensionable Earnings" for any year means the upper limit above which annual earnings are not subject to contributions in that year.

For 1966 and 1967, the YMPE was $5,000. Beginning in 1968 it was adjusted upward in steps of integral hundreds of dollars in accordance with increases in the "Pension Index", reaching $5,600 in 1973. It was fixed at $6,600 and $7,400 for 1974 and 1975, respectively. For each year after 1975 it is determined as being equal to 112.5% of the YMPE for the preceding year but not more than the quantity

$$52(I_{z-1})(I_{z-3}+I_{z-2}+I_{z-1}) / (I_{z-4.5}+I_{z-3.5}+I_{z-2.5})$$

where I_{z-1} is the average of the Industrial Composite (Statistics Canada: average weekly wages and salaries) for the 12 months ending June 30 in the preceding year. Once the YMPE is linked to average industrial earnings in this manner, the latter formula is to be continued and the former increase of 12.5% per annum is to be abandoned. If the amount calculated by formula is not a multiple of $100, the nearest lower multiple of $100 is used. However, the YMPE is not allowed to decrease.

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* All members of the Canadian Forces and the Royal Canadian Mounted Police are subject to the Canada Pension Plan.

Year's Basic Exemption (YBE)

"Year's Basic Exemption" for any year means the lower limit below which annual earnings are not subject to contributions. It is calculated as 12% of the YMPE for each year from 1966 to 1974 inclusive and 10% thereafter (rounded if necessary to the nearest lower multiple of $100). The basic exemption for a particular year is prorated in individual cases to allow for periods before age 18, after age 70 or death and while on retirement or disability pension.

Contributory Earnings

"Contributory earnings" for any year means the earnings of a contributor on which contributions are payable, i.e., earnings between the YBE and the YMPE for that year.

Unadjusted Pensionable Earnings

"Unadjusted pensionable earnings" for any year means all earnings of a contributor up to the YMPE provided that required contributions have been made in that year. (In case of dissolution of marriage by divorce or legal annulment after January 1, 1978, and upon application by either spouse within three years, earnings credits of spouses acquired during their marriage may be added and divided equally between them.)

Pensionable Earnings

"Pensionable earnings" for any year means "unadjusted pensionable earnings" multiplied by the ratio that the average YMPE for the year when a retirement pension or other earnings-related benefit becomes payable under the Act and for the two preceding years bears to the YMPE for the year in which the contributions were made.

3. Automatic Adjustment features

Several elements of the Plan are subject to automatic adjustment in accordance with changes in specified indices. These elements include:

(a) the YMPE and, dependent thereon, pensionable earnings upon which all earnings-related benefits going into payment are based, the upper limit on the amount of death benefit and the Year's Basic Exemption.

(b) all monthly benefits payable.

Annual adjustments of all elements subject to automatic adjustment depend on changes in the Pension Index constructed as described in the next following paragraph, with two exceptions. Firstly, annual adjustments of the contributory earnings limits (YMPE and YBE) after 1973 and of unadjusted pensionable earnings to obtain pensionable earnings are as described above. Secondly, the monthly amount of any earnings-related benefit that emerged prior to 1974 equals the initial monthly amount multiplied by the Pension Index for the Year of payment and divided by the average of the Consumer Price Indices (CPI) for the twelve months ending with June of the year preceding the year of emergence.

For 1967, the Pension Index was computed as the average of the CPI's for Canada for the twelve months ending with June 1966. For each year from 1968 through 1973, it was computed as the average of the CPI's for the twelve months ending with June of the preceding year or 1.02 times the Pension Index for the preceding year, whichever was the lesser. (In practice, the latter formula was always applicable). The Pension Index for 1974 equals the average of the CPI's for the twelve months ending with June 1972, multiplied by the average of the CPI's for the sixteen months ending with October 1973, and divided by the corresponding average for the sixteen months ending with June 1972*. The Pension Index for 1975 and later years equals the average of the CPI's for the twelve months ending with October of the preceding year in each case, except that the Pension Index for the preceding year will be retained if a reduction in its value would otherwise occur.

4. Retirement Pension

Upon application, a contributor aged 65 or over becomes entitled to a retirement pension. (A contributor in receipt of a disability pension becomes entitled to a retirement pension on attainment of age 65). After a retirement pension becomes payable or, in any event, after age 70 a contributor is not eligible to contribute under the Plan. Thus, except for adjustment of the amount of pension in payment in accordance with changes in the Pension Index, the amount of pension is fixed at the time the pension first becomes payable.

In general, the initial amount of retirement pension payable to a contributor is based on the whole history of his Pensionable Earnings from January 1, 1966, or from attainment of age 18, if later, until the year in which the pension commences.

A convenient formula for determining the initial amount of retirement pension involves the use of an "average earnings ratio", as follows:

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* The Pension Index for 1974 is defined differently in the Act, but it is used in such a way as to produce the same benefit amounts as the procedure described here.

Formula for Retirement Pension

The initial amount of annual pension is equal to 25% of the average YMPE for the three years ending with the year in which pension commences, multiplied by the "average earnings ratio" which is the average of a number of the highest "annual earnings ratios", such number being determined as follows:

Years in Contributory Period	Number of highest "annual earnings ratios" used in calculating average earnings ratio
less than 10	(a) the number of years in the contributory period or (b) 10 less the number of years when a disability pension was payable, if greater
10 or more	(a) 85% of the years in the contributory period less the number of years during which the contributor had at least one child less than 7 years of age, was a family allowance recipient and had (i) earnings less than YBE or (ii) earnings greater than the YBE but which if dropped out would increase his "average earnings ratio" or (b) 10, if greater

In any year, the "annual earnings ratio" referred to above is the ratio of "unadjusted pensionable earnings" to the YMPE in that calendar year. (It should be noted that if no contributions are made during a calendar year, the "annual earnings ratio" for that year is zero; and for any year in which a contributor's earnings exceed the YMPE, the ratio is one).

The "contributory period" for purposes of retirement pensions is the number of years from January 1, 1966, (or from attainment of age 18, if later), to age 65, less the number of years, if any, during which a disability pension is payable.

Examination of the above formula will make it clear that, in addition to the whole period during which a disability pension is payable, a certain number of years associated with the lowest recorded "annual earnings ratios" will normally be excluded in the benefit calculations by reason of contributions made after age 65 and by reason of the 15% and child rearing "drop-out" provisions; however, the drop-out must not reduce the total number of years to less than ten.

5. Disability Pension

A contributor aged less than 65, who becomes disabled within the meaning of the disability provisions of the Plan, is entitled to a disability pension, under the following conditions:

Number of calendar years in contributory period	Number of calendar years for which contributions must have been made
Less than 10	5
10 to 30	5 of last 10, and in total at least 1/3 of the number of calendar years in the contributory period
30 or more	5 of last 10, and in total at least 10

The "contributory period" for purposes of disability pensions is the number of years from January 1, 1966, (or from attainment of age 18, if later) to the date of commencement of the disability pension, less the number of years during which a disability pension was previously payable.

Disability pensions commence with the fourth month following the month of disablement and are payable until age 65 or until death or recovery from disability at an earlier age.

The amount of pension payable is composed of two parts, namely, a flat-rate part depending only on the year in which the disability pension is payable, and an earnings-related part depending initially only on the pensionable earnings record of the contributor as of the date of commencement of the disability pension. The initial flat-rate part is determined as $25 per month adjusted in accordance with the increase in the Pension Index from 1967 to the year in which the disability pension commences (for example, $78.60 for pensions payable in 1983). The initial earnings-related part is equal to 75% of an earnings-related pension calculated in the manner described earlier for retirement pensions, except that the contributory period ends at the date of commencement of the disability pension and that, both before and after December 31, 1975, the number of years to be taken into account in determining the "average earnings ratio" is as follows:

Years in Contributory Period	Number of highest "annual earnings ratios" used in calculating average earnings ratio
Less than 10	the number of years in the contributory period or
10 or more	(a) 85% of the years in the contributory period less the number of years during which the contributor had at least one child less than 7 years of age, was a family allowance recipient and had (i) earnings less than the YBE or (ii) earnings greater than the YBE but which if dropped out would increase his "average earnings ratio" or (b) 10, if greater

6. Disabled Contributor's Child's Benefit

An unmarried child of a contributor who is entitled to a disability pension is entitled to a benefit provided the child

(i) is under age 18, or

(ii) is aged 18 or over but under age 25 and has been attending school full-time and substantially without interruption since attainment of age 18 or the time of the contributor's disability, whichever occurred later.

The amount of pension payable in respect of each child is equal to the flat-rate benefit payable to the disabled contributor. However, only one child's benefit is payable in respect of each child, even if both parents are entitled to a disability pension; furthermore, a child may not simultaneously receive a disabled contributor's child's benefit and an orphan's benefit (see 7(c) below).

7. Survivor's Pension and Orphan's Benefit

(a) General

A surviving spouse and an orphan may become entitled to a "survivor's pension" and an "orphan's benefit", respectively. For entitlement to such a pension, the deceased contributor must have made contributions during the lesser of

(i) ten calendar years, or

(ii) one-third of the number of calendar years in which contributions could have been made, but not less than three years.

By the expression "calendar years in which contributions could have been made" is meant all calendar years after 1965, or from age 18, if that age was attained after 1965, to the attainment of age 65 or cessation of contributions, if later, but not beyond the month of death, and excluding any calendar month for which a disability pension was payable.

A surviving spouse may become entitled to a survivor's pension by reason of having dependent children, being disabled or simply being over age 35 at the date of the contributor's death. The amount of pension payable to a surviving spouse who becomes entitled to a survivor's pension for more than one reason is the largest to which she or he is entitled for any one of such reasons.

A surviving spouse who becomes entitled to both a survivor's pension and either a disability pension or a retirement pension is subject to an overriding limitation on all dual pensions (see 8 below).

A survivor's pension is suspended during any period of remarriage.

(b) Survivor's Pension

(i) Definition of "Surviving spouse with dependent children"

A "surviving spouse with dependent children" means a widow or widower who wholly or substantially maintains an unmarried child of the deceased contributor where the child is

A. under age 18,

B. aged 18 or over but under age 25 and has been attending school full-time and substantially without interruption since attainment of age 18 or the time of the contributor's death, whichever occurred later, or

C. aged 18 or over and is disabled, having been disabled without interruption since attainment of age 18 or the time of the contributor's death, whichever occurred later.

(ii) Surviving spouses aged between 45 and 65 at date of contributor's death

A surviving spouse aged between 45 and 65 at widowhood (widowerhood) is entitled to a survivor's pension.

The amount of pension payable until the surviving spouse attains age 65 is composed of two parts, namely, a flat-rate part depending only on the year in which the survivor's pension is payable and an earnings-related part depending initially only on the pensionable earnings record of the contributor to the date of his or her death. The initial flat-rate part is determined as $25 per month adjusted in accordance with the increase in the Pension Index from 1967 to the year in which the death of the contributor occurs. The initial earnings-related part is equal to 37.5% of an earnings-related pension based on the contributor's pensionable earnings record calculated as at the date of the contributor's death or commencement of his retirement pension, whichever is the earlier, except that, in the latter case, the calculated pension is adjusted in accordance with the increase in the Pension Index from the year in which the contributor's retirement pension became payable to the year of his death. In general, the amount of the contributor's earnings-related pension is calculated in the manner described earlier for retirement pensions, except that the "contributory period" ends at the date of death or at age 65, whichever is the earlier, and that the number of years to be taken into account in determining the "average earnings ratio" is as described above for disability pension.

(iii) Surviving spouses aged less than 45 at the beginning of widowhood (widowerhood) without dependent children and not disabled

A surviving spouse without dependent children and not disabled, aged less than 35 years at the widowhood (widowerhood), is not entitled to a survivor's pension.

A surviving spouse without dependent children and not disabled, aged 35 or more years but less than 45 at widowhood (widowerhood) is entitled to an amount of pension, calculated as described in (ii) above, reduced by 1/120th of such amount for each month that the surviving spouse's age at the beginning of widowhood (widowerhood) is less than 45.

(iv) Surviving spouses aged less than 45 at the beginning of widowhood (widowerhood) with dependent children

A surviving spouse aged less than 45 at widowhood (widowerhood), with dependent children, is entitled to a survivor's pension calculated as described in (ii) above.

If a surviving spouse in receipt of a survivor's pension ceases to be a "surviving spouse with dependent children", before attaining age 45 and not disabled at that time, the amount of the survivor's pension is discontinued or reduced in the manner described in (iii) above in accordance with the surviving spouse's age at the time she or he ceased to be a "surviving spouse with dependent children".

(v) Disabled surviving spouses aged less than 65

A surviving spouse aged less than 65 is entitled to a survivor's pension, if she or he either is disabled at the date of death of the contributor or becomes disabled at a later date.

The disabled surviving spouse's pension is payable from the month following the month in which the contributor dies or from the month following the month in which the surviving spouse become disabled, whichever is later.

If the disabled surviving spouse recovers from disability before age 45, the amount of the survivor's pension is discontinued or reduced in the manner described in (iii) above in accordance with the surviving spouse's age at the time of recovery.

The initial amount of pension is calculated as described in (ii) above, except that, in the case where the surviving spouse becomes disabled subsequent to the death of the contributor, the pension so calculated is adjusted in accordance with changes in the Pension Index from the year in which the contributor died to the year in which disability occurs.

(vi) Surviving spouses aged 65 or over

At age 65, or upon widowhood (widowerhood) at a later age, a surviving spouse who is not then in receipt of an age retirement pension or to whom such a pension does not become payable immediately, is entitled to an amount of pension equal to 60% of an earnings-related pension* based on the pensionable earnings record of the deceased spouse.

At the time a surviving spouse becomes entitled to both a survivor's pension and a retirement pension or to either one while in receipt of the other, the total amount of pension is equal to the greater of

A. 60% of the surviving spouse's own retirement pension plus 60% of an earnings-related pension* based on the pensionable earnings record of the deceased spouse, or

B. 100% of the surviving spouse's own retirement pension plus 37.5% of an earnings-related pension* based on the pensionable earnings record of the deceased spouse,

subject to the limitation on the maximum initial amount payable in respect of dual pensions, as explained in 8 below.

(c) Orphan's Benefit

The provisions for orphans are analogous to those described earlier for children of disabled contributors.

For purposes of orphans' benefits, an "orphan" means an unmarried child of a deceased contributor, where the child is

(i) under age 18, or

(ii) aged 18 or over but under age 25 and has been attending school full-time and substantially without interruption since attainment of age 18 or the time of the contributor's death, whichever occurred later.

The amount of pension payable in respect of each orphan is $25 per month adjusted in accordance with changes in the Pension Index from 1967 to the year in which the benefit is payable. However, only one orphan's benefit is payable in respect of each child, even if both deceased parents were contributors; furthermore as noted in 6 above, a child may not simultaneously receive both an orphan's benefit and a disabled contributor's child's benefit.

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* An earnings-related pension, calculated as described in (ii) above, adjusted, where applicable, in accordance with changes in the Pension Index from the year in which the contributor died to the year in which the surviving spouse attains age 65 or the year in which a retirement pension becomes payable to her (him) while in receipt of a survivor's pension.

8. Dual Pensions

Benefits payable to persons who become entitled to both a survivor's pension and either a disability or a retirement pension, are subject to an overriding limitation. The total annual amount of the two pensions cannot initially exceed an amount equal to 25% of the average of the YMPE for the three years ending with the year in which the later of the two pensions commences (that is, an amount equal to the maximum retirement pension applicable for that year).

9. Death Benefit

A lump-sum benefit is payable to the estate of a deceased contributor who made contributions in at least the minimum number of calendar years required for entitlement to a survivor's pension.

The amount of benefit is equal to

(a) in respect of a contributor to whom a retirement pension was payable at the time of death, one-half of the annual amount of pension payable in the year of death, adjusted to exclude any reduction that may have arisen by reason of commencement of pension within the ten-year transitional period ending December 31, 1975, or

(b) in respect of any other contributor, one-half of the annual amount of an earnings-related pension calculated in the manner described for retirement pensions, except that the deceased contributor's contributory period ends at the date of death or at age 65, whichever is the earlier,

subject to the limitation that the amount of benefit cannot exceed 10% of the YMPE applicable in the year of the contributor's death.

10. Amendments

Any major amendment providing for changes in benefits or contributions cannot become effective until the first day of the third year following the year in which notice of intention to introduce such a measure was laid before Parliament and requires the consent of two-thirds of the provinces having in aggregate at least two-thirds of the population of Canada excluding the Yukon and the Northwest Territories.

Two amendments became effective subsequent to the tabling of Statutory Actuarial Report No.6. A 1981 amendment provided that employment of a person by his or her spouse would not be considered "excepted employment" as long as the remuneration paid may be deducted under the Income Tax Act in computing the income of the spouse. A 1977 amendment providing for the special child rearing drop-out became effective in 1983 when the necessary provincial consent was obtained.

Appendix B

Assumptions and Procedures

Appendix B

ASSUMPTIONS AND PROCEDURES

1. General

We have continued the practice first adopted for Statutory Actuarial Report No. 3 (December 31, 1973) of basing the Main Tables on one set of what we regard as reasonably realistic demographic assumptions and long-term relationships between the various economic factors.

As noted below, a number of changes were made in the assumptions, and the number of auxiliary fund projections (Section III) was increased to allow greater appreciation of the sensitivity of the projections to certain major assumptions.

2. Economic Assumptions

The economic assumptions used for the Main Tables differ slightly from those used for purposes of the preceding report, a key feature of which was the assumption that (except for a short transition period) the gap between the annual increase in average earnings and the increase in the Consumer Price Index would remain constant at 2.0%. In the light of experience in Canada over the last fifty years this assumption might still seem appropriate. However, there appears to be a growing body of opinion holding that real increases in average earnings in the foreseeable future will continue to be lower than in the past, and there may be a slow downward trend in the compound average annual rate of real increase in earnings (measured as a function of average industrial earnings and the Consumer Price Index) as suggested by the following table:

Average Annual Compound Percentage Real Increase in Average Wages and Salaries

5 Year Periods		15 Year Periods		25 Year Periods	
Final Year	Increase (%)	Final Year	Increase (%)	Final Year	Increase (%)
1932	2.29	1952	2.75	1957	2.44
1937	1.13	1967	2.37	1982	1.79
1942	2.37	1982	1.56		
1947	3.18				
1952	2.71				
1957	2.82				
1962	1.71				
1967	2.58				
1972	3.97				
1977	1.36				
1982	-0.61				

The two intermediate actuarial cost projections (1983) made for the United States social security system (OASDI) have been based on assumptions for real increases in earnings in the long term of 1.5% and 2% respectively. For purposes of the Main Tables in this report, it was assumed that beginning in 1993 average earnings would increase at a real rate of 1.5% per annum (actually approximately 1.449%). However, as for the preceding report, we have prepared auxiliary fund projections, on an assumption of real rate of increase in earnings one-half percentage point lower, which may be found in Section III of the report.

The narrrowing of the gap between the assumed increases in earnings and prices could be accomplished either by raising the assumed rate of increase in prices or lowering the rate of increase in earnings. The latter seemed more appropriate, having regard to the sustained and generally supported efforts to lower the level of inflation; accordingly, the assumed ultimate rate of increase in earnings was decreased from 5.5% to 5.0% and the assumed ultimate rate of increase in the Consumer Price Index was maintained at 3.5%.

As noted in Section IV of the Report, the assumed level of inflation is of relatively slight practical significance in determining the level of costs expressed as a percentage of contributory earnings, as long as real increases in earnings are not affected. The use of higher assumed rates of inflation, while doing very little to enhance the value of the projections, could do substantial harm by adding weight to expectations of higher levels of inflation.

It was decided to keep the assumed ultimate annual rate of interest on new investments at 6.5%. This assumption, coupled with an assumption of 3.5% for increases in the Consumer Price Index, implies an assumed real rate of investment earnings of 3% per annum (actually 2.899%.) This is the same real rate of investment earnings that was assumed for the preceding report, and for a fund invested entirely at rates reflecting long term Government of Canada bond rates is thought to be reasonably consistent with an average long term inflation rate of 3.5%, particularly, if the rate of inflation is assumed to be somewhat unstable. In any event , it must be recognized that rates of interest do not have a significant effect on contribution rates, unless a relatively high degree of funding were contemplated. The assumed rate of interest is highly significant in the calculation of the contribution rate on an "actuarially funded" basis and of the related unfunded actuarial liability (see Appendix C); however, since the primary purpose of such calculation is to compare the cost of CPP benefits with costs of private pension plans, an assumed real rate of investment earnings of 3% p.a. appears reasonably appropriate for this purpose as well.

The three key economic assumptions* used for the main tables are as follows:

Year	Annual increase in CPI (%)	Annual increase in average earnings (%)	Annual rate of interest on new bonds (%)
1983*	5.8	7.4	11.6
1984	5.2	5.2	10.5
1985	5.3	5.4	9.6
1986	4.8	5.0	8.7
1987	4.5	5.1	8.0
1988	4.6	5.5	7.4
1989	4.5	5.5	6.9
1990	4.2	5.3	6.7
1991	4.0	5.2	6.6
1992	3.8	5.1	6.5
1993 and later	3.5	5.0	6.5

3. Population Projections

(a) General

The populations required for the Canada Pension Plan pertain to Canada excluding Quebec, but including all members of the Canadian Forces and the Royal Canadian Mounted Police. The population projections used for purposes of the financial estimates were obtained by simple subtraction of the projected populations for Quebec from the projected populations for Canada. Consequently, the projected populations do not make allowance for members of the Canadian Forces and Royal Canadian Mounted Police resident in Quebec. However, provision for this group was made implicitly in the development of the participation rates given in Section 4 of this appendix.

Populations were projected from the 1976 census, after first applying adjustment factors to compensate for the 1976 census undercount. The projections carry forward to the year 2100, which provides a period of 118 years from the effective date of this examination.

Detailed figures for selected years by sex and age-group are given in Schedules 5, 6 and 7 of this appendix following the description of the underlying fertility, mortality and migration assumptions. Schedule 1 below shows census and projected total populations for selected years for Canada, excluding Quebec, as well as some of the noteworthy projected demographic relationships.

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* Assumptions for 1984 to 1988 with regard to increases in average earnings and prices are those used for the budget of February 15, 1984; these were extended to reach the ultimate level by 1993. The rate of interest on new bonds was designed to bring the implicit average real rate for the ensuing ten years down smoothly from its 1983 level to the ultimate level of 3% by 1990. The factors for 1983 reflect actual experience.

Schedule 1*

Middle of Year	Census and Projected Populations (in thousands) Male	Female	Total	Ratio of Population Aged 65 and over to Population Aged 20 to 64 (%)	Birth Rate per 1000
1961	6,587	6,392	12,979	16.4	26.1
1971	7,801	7,740	15,541	16.4	17.6
1976**	8,568	8,527	17,095	16.3	15.8
1990	10,090	10,242	20,332	18.4	15.9
2000	11,134	11,390	22,524	19.8	14.2
2025	13,398	13,919	27,317	31.1	13.3
2050	15,231	15,965	31,196	34.2	13.2
2100	19,483	20,302	39,785	34.7	13.1

(b) Fertility

The fertility assumptions used for the projections of the population for Canada as well as those for Quebec provide that the age-specific fertility rates for 2000 and later produce a total fertility rate of 2.0. (The value used for purposes of the preceding report was 2.112 which corresponded approximately to a net reproduction rate of one; i.e, every female born alive had been assumed to bear one female child.) For the years 1983 to 1999, the total fertility rates were obtained by employing a linear interpolation between the 1982 actual values (1.6935 for Canada and 1.5225 for Quebec) and the assumed value of 2.0 for the year 2000. For the years 1976 to 1982, the actual total fertility rates were available and, accordingly, were used directly in the population projections. For purposes of distributing the ultimate total fertility rate into age-specific fertility rates, the rates for age-groups below 20 and above 34 were assumed to have reached their ultimate level around 1980 and the remainder was distributed in the same proportion as the average for the two years 1981 and 1982. The same distribution among age-groups was used for all years in the ultimate periods of the two projections.

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* All figures shown are for Canada excluding Quebec

** 1976 starting populations adjusted for undercount of 1976 census

Schedule 2

Selected Fertility Rates
(Number of live births per 1000 females in age group)

Canada*

Female Age Group	Recently Experienced Fertility Rates					Fertility Rates Assumed for 2000 and later
	1965	1970	1975	1981	1982	
15-19	49.3	42.8	35.3	26.4	26.5	28.0
20-24	188.6	143.3	112.7	96.7	95.4	115.4
25-29	181.9	147.2	131.2	126.9	124.7	151.4
30-34	119.4	81.8	64.4	68.0	68.6	82.0
35-39	65.9	39.0	21.6	19.4	20.2	20.0
40-44	22.0	11.3	4.8	3.2	3.1	3.0
45-49	2.0	0.9	0.4	0.2	0.2	0.2
Total	3145.0	2331.5	1852.0	1704.0	1693.5	2000.0

Province of Quebec

Female Age Group	Recently Experienced Fertility Rates					Fertility Rates Assumed for 2000 and later
	1965	1970	1975	1981	1982	
15-19	26.4	20.7	19.5	15.0	15.1	20.0
20-24	168.4	113.9	96.4	87.8	84.1	110.9
25-29	179.6	131.0	136.2	131.1	122.0	162.8
30-34	121.5	77.4	69.4	67.8	62.8	84.1
35-39	73.8	39.0	23.4	18.1	17.7	19.0
40-44	26.7	11.8	5.2	2.8	2.7	3.0
45-49	2.7	1.0	0.6	0.2	0.1	0.2
Total	2996.0	1974.0	1753.5	1614.0	1522.5	2000.0

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* Newfoundland is excluded because of unavailability of data.

It may be seen from Schedule 2 that , although recent years have shown a steady decline in the level of total fertility, it is assumed that by the year 2000 fertility will return to the level of about 1972 and 1970 for Canada and the province of Quebec, respectively.

This ultimate assumed level of fertility is somewhat lower than the rate of 2.112 assumed for 1985 and later for purposes of Actuarial Report No.6 which was equivalent to a net reproduction rate of one. Of course, it is possible that fertility rates may become stabilized at an even lower level. Under such conditions, however, it seems reasonable to expect that the relative size of the productive population will be maintained either through increased immigration or later retirements or a combination of both. (It is also possible, of course, that the relative size of the productive population will not be maintained but that this will be compensated by new technological developments or that a lower level of production will become acceptable.)

The total fertility rate for 2000 and later of 2.0 is the same as that used for purposes of the medium projections of the 1983 report on the U.S. Social Security system, and is the basis for all tables in this report except Tables 12 and 13. The latter are based on a total fertility rate of 1.7 which implies the continuation of the current low level of fertility.

(c) Mortality

Mortality is projected to improve from Life Tables, Canada and the Provinces, 1975-1977*, assumed applicable for 1976, to an ultimate mortality table for year 2050 and later, which is assumed to apply to Canada as well as to Quebec only. For the intermediate years mortality rates were obtained by a geometric interpolation; i.e., a constant percentage decrease in mortality from one year to the next was assumed.

The ultimate mortality table used in our population projections is in part based on work done by the Office of the Actuary of the U.S. Social Security Administration. "Actuarial Study No. 85 - United States Population Projections for OASDHI Cost Estimates" derives mortality rates for the year 2050 by considering death rates, by age-group and sex, in 10 broad groups of causes of death, and by combining the assumed percentage reductions for each cause of death to obtain average reductions in mortality by age-group and sex for all causes combined. For the current Canada Pension Plan projections, the same relative improvements in mortality from 1970-1972 levels implied by Alternative II (medium) in Actuarial Study No. 85 were assumed to be applicable to the 1975-77 Canada Life Table. The resulting ultimate table (assumed applicable to the year 2050 and later) produces an expectation of life at birth of 75.4 for males and 83.4 for females, compared to 70.2 and 77.5 respectively, for the 1975-77 Canada Life Table. At age 65 the expectation of life according to the ultimate table is 17.1 for males and 22.4 for females, compared to 14.0 and 18.0, respectively, for the 1975-77 Canada Life Table. Sample values of the ultimate mortality rates are given in Schedule 3, along with a comparison of mortality rates on the basis of the 1940-42 and 1975-77 Canada Life Tables.

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* Published by Statistics Canada and referred to herein as 1975-77 Canada Life Tables.

Schedule 3

Comparison of Mortality Rates for the Province of Quebec and for Canada
(Annual deaths per 1,000 persons)

Age	1940-42 Canada Life Tables	1975-77 Canada Life Tables		Rates Assumed for Year 2050
		Province of Quebec	Canada	
Males				
0	62.50	14.69	14.81	8.67
1	7.21	1.25	1.03	0.57
5	1.98	0.65	0.47	0.30
10	1.22	0.35	0.28	0.22
20	2.41	1.86	1.81	1.59
30	2.60	1.62	1.46	1.22
40	4.28	2.82	2.71	1.70
50	8.95	8.12	7.33	4.37
60	20.29	20.84	18.43	11.85
70	47,59	47.22	42.48	28.65
80	117.38	101.07	95.14	67.18
90	250.48	221.56	211.51	136.08
Females				
0	49.31	12.07	11.92	6.52
1	6.34	0.98	0.93	0.59
5	1.57	0.52	0.37	0.23
10	0.90	0.28	0.23	0.15
20	1.80	0.53	0.55	0.41
30	2.60	0.69	0.65	0.42
40	3.86	1.50	1.51	0.86
50	7.01	3.81	3.76	2.41
60	15.28	9.45	8.72	5.84
70	38.12	24.35	21.72	14.28
80	101.96	65.61	59.76	35.75
90	233.91	198.48	166.68	85.90

The 1975-77 Canada Life Tables for Canada, the corresponding tables for Quebec, and the ultimate mortality tables constructed as above consist of one-year probabilities of mortality for individual ages 0 to 109. The 1976 census population data for Canada and Quebec, available by individual ages up to 89, were adjusted to spread the 90+ age-group by individual ages to 109. Survivors of the population for a particular year were then obtained by simply applying the probabilities of survival for that year to the given population.

(d) Migration

Immigration as well as emigration are generally recognized to be rather volatile parameters of future population growth, since they are subject to a variety of demographic, economic, social and political factors and immigration is subject to government control. During the period from 1971 to 1983, for example, immigration to Canada varied from 83,000 to 214,000 p.a. and emigration from Canada is estimated to have fluctuated between 42,000 and 84,000 p.a. Net immigration during the period averaged about 79,000 p.a.

For purposes of this report it was decided to assume 135,000 immigrants and 60,000 emigrants for 1976 and both these figures were increased with time so as to maintain an approximately constant ratio of net immigration to total current Canadian population of 0.32%. (This assumption was used for all projections except Tables 11 and 13 which are based on a constant number of net immigrants of 75,000 annually.)

For purposes of projecting the population of Quebec it was assumed that 16% of both immigrants and emigrants would be attributable to that province; recent statistics showed 16.4% of immigrants and 15.6% of emigrants attributable to Quebec, based on Employment and Immigration Canada data for 1979-82 and Revenue Canada data for 1978-81, respectively.

In addition it was assumed that Quebec would experience net interprovincial emigration of 24,178 in 1976 decreasing linearly to zero by the year 2000. The starting figure of 24,178 was based on the mean of 1976-81 and 1971-81 experience but excluding the year 1977 which reflected an unrepresentative high level of emigration following the 1976 provincial election.

The distributions of immigrants and emigrants by age-group and sex used for purposes of the projections were based on Statistics Canada data for 1977 to 1980 which were almost identical to the results for 1975-1978; the distributions are shown in Schedule 4.

Schedule 4

Distributions of Immigrants and Emigrants by Age Group and Sex

	Immigrants		Emigrants	
Age Group	Males	Females	Males	Females
	(%)	(%)	(%)	(%)
0- 4	4.511	4.337	3.367	3.182
5- 9	4.155	3.857	4.054	3.936
10-14	4.022	3.692	3.773	3.710
15-19	5.480	6.091	3.551	3.968
20-24	7.342	8.665	3.524	6.280
25-29	6.900	6.639	6.201	8.110
30-34	4.339	3.872	7.183	6.599
35-39	2.561	2.235	4.423	4.533
40-44	1.533	1.511	3.373	2.958
45-49	1.206	1.699	2.462	2.200
50-54	1.206	2.153	1.853	2.002
55-59	1.386	2.213	1.495	1.697
60-64	1.649	1.893	1.162	1.222
65-69	1.004	1.319	0.972	0.899
70+	0.911	1.527	0.557	0.721
Total:	48.205	51.703	47.950	52.017

(e) Populations

In Schedules 5, 6 and 7 are shown for Canada, the Province of Quebec and Canada excluding Quebec, respectively, the 1976 starting population* and the projected populations for 1990, 2000, 2025, 2050 and 2100. The populations shown are distributed by sex and broad age groups. These populations were used for all projections except Tables 11, 12 and 13.

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* 1976 census adjusted for undercount.

SCHEDULE 5

POPULATIONS FOR ALL CANADA*
(IN THOUSANDS)

MIDDLE OF YEAR		TOTAL	14 AND UNDER		15 - 19		20 - 39		40 - 59		60 - 64		65 - 69		70 AND OVER	
			NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL
1976	MALES	11730	3067	26.1	1219	10.4	3707	31.6	2404	20.5	441	3.8	345	2.9	547	4.7
	FEMALES	11728	2920	24.9	1173	10.0	3613	30.8	2416	20.6	472	4.0	385	3.3	749	6.4
	TOTAL	23458	5987	25.5	2392	10.2	7320	31.2	4820	20.5	913	3.9	730	3.1	1296	5.5
1985	MALES	12867	2901	22.5	1027	8.0	4648	36.1	2675	20.8	529	4.1	397	3.1	690	5.4
	FEMALES	13026	2749	21.1	982	7.5	4546	34.9	2662	20.4	600	4.6	472	3.6	1015	7.8
	TOTAL	25893	5650	21.8	2009	7.8	9194	35.5	5337	20.6	1129	4.4	869	3.4	1705	6.6
2000	MALES	14815	3243	21.9	1047	7.1	4458	30.1	4034	27.2	568	3.8	499	3.4	966	6.5
	FEMALES	15176	3076	20.3	996	6.6	4312	28.4	4066	26.8	620	4.1	574	3.8	1532	10.1
	TOTAL	29991	6319	21.1	2043	6.8	8770	29.2	8100	27.0	1188	4.0	1073	3.6	2498	8.3
2025	MALES	17519	3553	20.3	1153	6.6	4808	27.4	4198	24.0	1110	6.3	972	5.5	1725	9.8
	FEMALES	18209	3368	18.5	1096	6.0	4634	25.4	4172	22.9	1194	6.6	1113	6.1	2632	14.5
	TOTAL	35728	6921	19.4	2249	6.3	9442	26.4	8370	23.4	2304	6.4	2085	5.8	4357	12.2
2050	MALES	19600	3940	20.1	1295	6.6	5344	27.3	4779	24.4	1074	5.5	920	4.7	2248	11.5
	FEMALES	20534	3733	18.2	1230	6.0	5146	25.1	4726	23.0	1135	5.5	1022	5.0	3542	17.2
	TOTAL	40134	7673	19.1	2525	6.3	10490	26.1	9505	23.7	2209	5.5	1942	4.8	5790	14.4
2100	MALES	24536	4903	20.0	1630	6.6	6642	27.1	6001	24.5	1301	5.3	1162	4.7	2897	11.8
	FEMALES	25533	4645	18.2	1548	6.1	6393	25.0	5926	23.2	1369	5.4	1280	5.0	4372	17.1
	TOTAL	50069	9548	19.1	3178	6.3	13035	26.0	11927	23.8	2670	5.3	2442	4.9	7269	14.5

* THESE POPULATIONS WERE USED FOR ALL TABLES OF FINANCIAL PROJECTIONS EXCEPT TABLES 11, 12 AND 13.

SCHEDULE 6

POPULATIONS FOR QUEBEC*
(IN THOUSANDS)

MIDDLE OF YEAR		TOTAL	14 AND UNDER		15 - 19		20 - 39		40 - 59		60 - 64		65 - 69		70 AND OVER	
			NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL
1976	MALES	3162	807	25.5	345	10.9	1044	33.0	647	20.5	111	3.5	86	2.7	122	3.9
	FEMALES	3201	768	24.0	335	10.5	1026	32.1	670	20.9	124	3.9	102	3.2	176	5.5
	TOTAL	6363	1575	24.8	680	10.7	2070	32.5	1317	20.7	235	3.7	188	3.0	298	4.7
1985	MALES	3342	728	21.8	259	7.7	1241	37.1	719	21.5	134	4.0	99	3.0	162	4.8
	FEMALES	3413	686	20.1	247	7.2	1214	35.6	739	21.7	156	4.6	123	3.6	248	7.3
	TOTAL	6755	1414	20.9	506	7.5	2455	36.3	1458	21.6	290	4.3	222	3.3	410	6.1
2000	MALES	3681	773	21.0	252	6.8	1087	29.5	1063	28.9	146	4.0	127	3.5	233	6.3
	FEMALES	3786	729	19.3	238	6.3	1043	27.5	1076	28.4	164	4.3	154	4.1	382	10.1
	TOTAL	7467	1502	20.1	490	6.6	2130	28.5	2139	28.6	310	4.2	281	3.8	615	8.2
2025	MALES	4121	811	19.7	266	6.5	1096	26.6	985	23.9	279	6.8	250	6.1	434	10.5
	FEMALES	4290	763	17.8	251	5.9	1050	24.5	973	22.7	297	6.9	287	6.7	669	15.6
	TOTAL	8411	1574	18.7	517	6.1	2146	25.5	1958	23.3	576	6.8	537	6.4	1103	13.1
2050	MALES	4369	861	19.7	284	6.5	1167	26.7	1069	24.5	245	5.6	211	4.8	532	12.2
	FEMALES	4569	809	17.7	268	5.9	1116	24.4	1050	23.0	256	5.6	232	5.1	838	18.3
	TOTAL	8938	1670	18.7	552	6.2	2283	25.5	2119	23.7	501	5.6	443	5.0	1370	15.3
2100	MALES	5053	992	19.6	331	6.6	1346	26.6	1240	24.5	273	5.4	246	4.9	625	12.4
	FEMALES	5231	932	17.8	312	6.0	1286	24.6	1217	23.3	284	5.4	267	5.1	933	17.8
	TOTAL	10284	1924	18.7	643	6.3	2632	25.6	2457	23.9	557	5.4	513	5.0	1558	15.1

* THESE POPULATIONS WERE USED FOR ALL TABLES OF FINANCIAL PROJECTIONS EXCEPT TABLES 11, 12 AND 13.

SCHEDULE 7

POPULATIONS FOR CANADA EXCLUDING QUEBEC*
(IN THOUSANDS)

MIDDLE OF YEAR		TOTAL	14 AND UNDER		15 - 19		20 - 39		40 - 59		60 - 64		65 - 69		70 AND OVER	
			NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL	NUMBER	PROP'N OF TOTAL
1976	MALES	8568	2260	26.4	874	10.2	2663	31.1	1757	20.5	330	3.9	259	3.0	425	5.0
	FEMALES	8527	2152	25.2	838	9.8	2587	30.3	1746	20.5	348	4.1	283	3.3	573	6.7
	TOTAL	17095	4412	25.8	1712	10.0	5250	30.7	3503	20.5	678	4.0	542	3.2	998	5.8
1985	MALES	9525	2173	22.8	768	8.1	3407	35.8	1956	20.5	395	4.1	298	3.1	528	5.5
	FEMALES	9613	2063	21.5	735	7.6	3332	34.7	1923	20.0	444	4.6	349	3.6	767	8.0
	TOTAL	19138	4236	22.1	1503	7.9	6739	35.2	3879	20.3	839	4.4	647	3.4	1295	6.8
2000	MALES	11134	2470	22.2	795	7.1	3371	30.3	2971	26.7	422	3.8	372	3.3	733	6.6
	FEMALES	11390	2347	20.6	758	6.7	3269	28.7	2990	26.3	456	4.0	420	3.7	1150	10.1
	TOTAL	22524	4817	21.4	1553	6.9	6640	29.5	5961	26.5	878	3.9	792	3.5	1883	8.4
2025	MALES	13398	2742	20.5	887	6.6	3712	27.7	3213	24.0	831	6.2	722	5.4	1291	9.6
	FEMALES	13919	2605	18.7	845	6.1	3584	25.7	3199	23.0	897	6.4	826	5.9	1963	14.1
	TOTAL	27317	5347	19.6	1732	6.3	7296	26.7	6412	23.5	1728	6.3	1548	5.7	3254	11.9
2050	MALES	15231	3079	20.2	1011	6.6	4177	27.4	3710	24.4	829	5.4	709	4.7	1716	11.3
	FEMALES	15965	2924	18.3	962	6.0	4030	25.2	3676	23.0	879	5.5	790	4.9	2704	16.9
	TOTAL	31196	6003	19.2	1973	6.3	8207	26.3	7386	23.7	1708	5.5	1499	4.8	4420	14.2
2100	MALES	19483	3911	20.1	1299	6.7	5296	27.2	4761	24.4	1028	5.3	916	4.7	2272	11.7
	FEMALES	20302	3713	18.3	1236	6.1	5107	25.2	4709	23.2	1085	5.3	1013	5.0	3439	16.9
	TOTAL	39785	7624	19.2	2535	6.4	10403	26.1	9470	23.8	2113	5.3	1929	4.8	5711	14.4

* THESE POPULATIONS WERE USED FOR ALL TABLES OF FINANCIAL PROJECTIONS EXCEPT TABLES 11, 12 AND 13.

4. Participation Rates and Modified Average Earnings

(a) For each of the years 1975-79, the CPP Division of the Department of Supply and Services provided us with a cumulative distribution of contributors and of earnings (for each of eleven age-groups subdivided by sex) over some eighty earnings ranges, expressed as percentages of the average earnings for the "sex/age-group cell" involved. We took the averages of the 5 years of experience, for each cell separately, and assumed that these would represent cumulative distributions of contributors (C-distribution) and of earnings (E-distribution) applicable to that cell indefinitely in the future. For illustrative purposes, the data might indicate that 60% of contributors for a particular cell earn less than 120% of average earnings for the cell (C-distribution) and account for 40% of total earnings for the cell (E-distribution). By interpolation between the various points of the distributions, we could then determine for any percentage of average earnings of any cell what percentage of contributors earn less than such percentage of average earnings, and what percentage of total earnings for the cell are earned by such contributors.

(b) Superficially, one might expect that there would be few, if any, contributors earning less than the Year's Basic Exemption (YBE), since, except in unusual circumstances, the contributions of such contributors are refundable and their earnings are not counted for purposes of calculating pensionable earnings. Surprisingly perhaps, the data revealed a very large number of contributors earning less than the YBE, as large or almost as large as one might expect if there were no YBE. The likely reason for this is that most contributors who earn less than the YBE during a year have low yearly earnings because they work for only a small fraction of the year, but during that fraction they have monthly earnings in excess of 1/12 of the YBE. Employer and employee contributions must be deducted at source for any month during which earnings exceed 1/12 of the YBE (unless the year's maximum has already been deducted), and while the employee contributions may be refundable if the employee earns less than the YBE during the year, the employer contributions are not. Hence, the bulk of earners earning less than the YBE in any year would seem to have employer contributions to their credit, and therefore have a record of their earnings for that year maintained on the CPP Record of Earnings, even though such earnings are not countable for pensionable earnings purposes. For this reason, it appeared reasonable to consider the cumulative distributions of contributors (C) and of their earnings (E), developed in (a) above,as being cumulative distributions of earners and of their earnings, for purposes of subsequent analysis.

(c) For 1970 to 1980, we obtained experience participation rates assuming no YBE for each "year/sex/age-group cell", by dividing the total number of contributors (assumed to be the total number of earners) by the projected populations. From other data available we extended these backward to 1966. We also projected them forward to 2100 taking into account the trend in such rates during the 1970-80 period, the continued increase in particpation by females, and our expectation as to likely changes in the future. The result was a complete set of participation rates assuming no YBE for each "year/sex/age-group cell" running from 1966 to 2100.

(d) We obtained average earnings assuming no YBE, for 1971 to 1980 for each "year/sex/age-group cell", by dividing total earnings by total number of contributors (assumed to be total number of earners). From other data available, these were extended backward to 1966.

For years subsequent to 1980 it was assumed that total average earnings (for all age-groups and both sexes combined) would increase at the same annual rate as the Industrial Composite (average wages and salaries) for Canada. For 1980-81 and 1981-82 we used the known rate of increase in the Industrial Composite and, for subsequent years, the rates of

increase in average earnings postulated in the economic assumptions (see 2 above).

However, we did not apply such aggregate rates of increase to each "sex/age-group cell", because we expect a gradual narrowing of the gap between earnings for males and females. Hence, we developed rates of increase in average earnings for each "sex/age-group cell" that would (i) produce an aggregate rate of increase equal to the rate postulated in the economic assumptions, (ii) produce rates of increase for each age-group, both sexes combined, that would be the same for all age-groups, and (iii) produce separate rates of increase for male and female average earnings for each age-group such that the ratio of female to male average earnings would move 1% of the way to unity each year.

In this manner average earnings, assuming no YBE, were calculated for each "year/sex/age-group cell" from the year of inception, 1966, to 2100.

(e) On the basis of the formula for the calculation of the Year's Maximum pensionable Earnings (YMPE) described earlier in this Report, and the assumed increases in average earnings taken to apply to the Industrial Composite of Wages and Salaries, we were able to project the YMPE for each year in the future.

Future YBE's were taken as 10% of the projected YMPE's rounded down to the nearest lower multiple of $100 if not a multiple of $100.

(f) For any "year/sex/age-group cell", the YBE could then be expressed as a percentage of average earnings and, using the C-distribution described in (a), we could calculate the proportion of earners earning less than the YBE. Applying the complements of such proportions to the participation rates assuming no YBE, yielded particpation rates excluding earners earning less than the YBE, which are the participation rates used in subsequent calculations. Sample values of such participation rates are shown in Schedule 8 below.

Schedule 8

Participation Rates

(used for all financial projections except Table 7.)

	Age Group	1985 (%)	2000 (%)	2025 (%)	2050 (%)	2100 (%)
Males	18-19	75.3	75.3	75.1	74.7	74.2
	20-24	89.5	89.6	89.4	89.2	88.9
	25-29	93.6	95.4	95.3	95.2	95.0
	30-34	96.4	96.7	96.6	96.5	96.3
	35-39	95.1	96.2	96.1	96.0	95.8
	40-44	94.3	94.3	94.2	94.1	93.9
	45-49	91.3	92.2	92.1	92.0	91.9
	50-54	89.3	89.5	89.4	89.3	89.1
	55-59	82.9	83.9	83.8	83.7	83.5
	60-64	69.5	70.0	69.9	69.8	69.6
	65-69	16.6	15.0	15.0	14.9	14.9
Females	18-19	63.9	65.8	69.0	69.5	70.1
	20-24	71.7	74.0	78.1	78.4	78.8
	25-29	64.4	66.9	70.9	72.0	72.4
	30-34	62.9	67.0	71.2	73.1	73.6
	35-39	63.0	69.7	74.1	76.7	77.2
	40-44	64.2	69.8	74.1	77.5	77.9
	45-49	59.4	67.2	71.4	75.4	75.8
	50-54	52.6	62.7	66.9	70.8	72.0
	55-59	42.7	52.6	59.3	63.2	65.0
	60-64	30.0	37.5	45.0	48.7	51.2
	65-69	5.7	4.9	5.0	5.0	5.1

(g) The next step was to calculate Modified Average Earnings for each "year/sex/age-group cell"; these are average pensionable earnings of contributors earning more than the YBE based on average earnings excluding portions of earnings above the YMPE. The formula used is

$$MAE = \frac{AE(EU - EL) + YMPE\,(1 - CU)}{1 - CL}$$

where

MAE = Modified Average Earnings

AE = Average earnings (developed in (d) above)

CL = Proportion of earners earning less than the YBE (calculated from C-distribution in (a) above)

CU = Proportion of earners earning less than the YMPE (calculated similarly to CL)

EL = Proportion of total earnings attributable to persons earning less than the YBE (calculated from E-distribution in (a) above)

EU = Proportion of total earnings attributable to persons earning less than the YMPE (calculated similarly to EL)

YMPE= Year's Maximum Pensionable Earnings, as developed in (e) above.

Sample values of Modified Average Earnings, which are the earnings used in the rest of the calculations for purposes of the Main Tables, are shown below.

Schedule 9

Modified Average Earnings
(used for all financial projections except Table 7)

		1985	2000	2025	2050	2100
	Y.M.P.E	$ 23,400	$ 51,100	$173,000	$585,900	$6,719,100
	Age Group					
Males	18-19	11,705	24,049	80,609	268,309	3,012,695
	20-24	14,943	30,762	103,173	343,512	3,855,400
	25-29	18,621	39,049	131,127	438,141	4,932,729
	30-34	19,957	42,294	141,919	474,757	5,348,189
	35-39	20,324	43,258	144,999	485,223	5,464,440
	40-44	20,304	43,194	144,777	484,223	5,448,945
	45-49	20,181	42,964	143,884	481,150	5,411,700
	50-54	19,942	42,508	142,396	476,235	5,355,347
	55-59	19,415	41,245	138,546	463,026	5,204,764
	60-64	18,122	38,298	129,115	431,654	4,857,119
	65-69	13,492	28,029	94,520	316,693	3,588,565
Females	18-19	9,249	19,658	69,573	240,631	2,839,822
	20-24	11,946	25,346	90,023	311,822	3,685,016
	25-29	14,687	31,646	112,444	389,782	4,594,927
	30-34	14,872	32,582	116,313	404,113	4,764,823
	35-39	14,803	32,862	118,259	412,450	4,874,531
	40-44	14,828	33,014	119,237	416,659	4,930,224
	45-49	14,804	33,094	119,533	418,062	4,948,807
	50-54	14,689	32,970	119,252	417,012	4,937,433
	55-59	14,366	32,095	116,538	407,552	4,830,622
	60-64	13,936	30,774	111,562	389,592	4,617,580
	65-69	10,760	23,220	83,318	291,092	3,473,808

(h) The element of unemployment was not introduced explicitly into the calculations, because it was felt that to do so would not measurably enhance the projections. Unemployment is however accounted for implicitly in the determination and projection of participation rates and average earnings.

5. Contributions and Expenses of Administration

(a) Contributory earnings were calculated as the product of (i) Modified Average Earnings less the Year's Basic Exemption, (ii) participation rates, and (iii) projected populations.

(b) Logic would seem to indicate that contributory earnings calculated in this fashion, to be used for the purpose of estimating contributions, should be increased somewhat to allow for the fact that contributions may be collected from other sources, e.g., (i) contributions made by an employer in respect of an employee earning less than the YBE are not refundable, (ii) excess contributions made by an employer in respect of an employee earning more than the YMPE are refundable only to the extent that the employee had earnings with that particular employer in excess of the YMPE, and (iii) in cases where employees or employers entitled to refunds do not claim such refunds, they are not made. However, while in the early years of the Plan contributions estimated in accordance with the above method were always less than contributions actually collected, from 1977 to 1981 there was virtually no difference. In 1982 actual contributions jumped to 108% of expected only to fall to 91% in 1983, but this seems to be attributable to the fact that nearly all contributions related to 1982 earnings were made in 1982, while 1983 was subject to the customary delay of receipts to the early months of the following calendar year. Consequently, for the purposes of this report, it was decided to estimate contributions for all future years in the manner described above, without adjustment, except for 1983 where the estimated value was replaced by the known actual value.

(c) The contribution rates assumed in the fund accumulations were applied to contributory earnings to estimate contributions.

(d) Costs of administration were assumed to be at the level of 0.1% of contributory earnings. Short run estimates were reduced somewhat below this level to bring them into line with what might be reasonably expected on the basis of recent experience. (see 12(b) below)

6. Retirement Pension

(a) For various sample cohorts, the average unadjusted pensionable earnings history of an average male and an average female was determined by multiplying modified average earnings by participation rates for each year of the person's primary contribution period, (i.e., the period running from January 1, 1966, or attainment of age 18, whichever is later, to attainment of age 65).

(b) The average unadjusted pensionable earnings for each year of the history were divided by the Year's Maximum Pensionable Earnings (YMPE) for the year involved and multiplied by the average of the three consecutive YMPE's ending with the year of attainment of age 65 to obtain the average adjusted pensionable earnings history.

(c) Average benefit factors are calculated as equal to 25% of (i) the sum of the average adjusted pensionable earnings of the individual less earnings that have to be dropped out, divided by (ii) 85% of his primary contribution period. Incidentally, it should be noted that by summing the average adjusted pensionable earnings in (i) for an individual of a cohort, we obtain the average sum of all the

pensionable earnings of individuals belonging to the cohort, which is what is desired. Unfortunately, there is no automatic way of determining what earnings have to be dropped out from this sum. The earnings that have to be dropped out for an individual are the lowest earnings of that individual for a number of years equal to 15% of the primary contribution period. We could make a reasonably accurate estimate of a maximum and a minimum value of the earnings to be dropped out for an average individual (the minimum value being 0, provided participation rates do not average more than 85%, the maximum value being the product of the lowest adjusted pensionable earnings value and the lowest participation rate over this average individual's contributory period, plus the product of the next lowest adjusted pensionable earnings value and the next lowest participation rate, and so on for a number of years equal to 15% of the primary contribution period). For males it was assumed that the earnings to be dropped would equal half of the maximum value. For females it was assumed that each female would have at least 15% years of nil earnings, so that no earnings were dropped.

(d) The average benefit factors for sample individual ages developed pursuant to (c) were increased slightly to allow for the disability drop-out provisions of the plan. Then, interpolation techniques were used to convert the factors applicable to individual ages into factors applicable to age-groups 65-69, 70-74 and so on in quinquennial attained years.

(e) Some contributors continue to participate in the plan for a while between age 65 and age 70; the benefit factors for age-group 65-69 were accordingly reduced by a percentage equal to 20 times the the ratio of those in the age-group 65-69 who have earnings to those eligible to receive a retirement pension at age 65.

(f) The above described techniques were used to develop benefit factors for benefits that would emerge after 1980. For benefits already in pay in 1980, benefits factors for quinary age-groups were developed by dividing benefits in pay in that year by the projected populations for that year. These benefit factors were also deemed to be applicable to those of the 1980 pensioners who survive to future years, subject to adjustment of the age-group 65-69 factors to take into account that not all eligible persons in that age-group would have applied for benefits by 1980.

(g) These benefit factors, when applied to the projected populations aged 65 and over, yielded estimated benefits payable in all future quinquennial years. Lagrange interpolation was then used to obtain benefits payable in non-quinquennial years.

(h) The benefits were thereafter increased by the required Pension Index escalation.

7. Disability Pension

(a) General Procedure

The general procedure used to estimate disability benefits was to (i) project flat-rate and earnings-related benefits in pay at the end of 1975 using suitable disability termination rates and augmenting benefits payable to such survivors according to Pension Index increases; (ii) estimate flat-rate benefits emerging in years subsequent to 1975 by application of disability incidence rates, probabilities of being insured for disability, and flat-rate benefit factors, to the projected populations developed as described in 3 above, (iii) estimate earnings-related benefits emerging in years subsequent to 1975 by application of disability incidence rates,

proportions of earnings insured for disability benefits, and earnings-related benefit factors, to the same projected populations; and (iv) project flat-rate and earnings-related benefits emerging in years subsequent to 1975 to future years in a manner similar to that used in projecting benefits in pay at the end of 1975, as described in (i).

The estimate of benefits paid in any particular future year would of course be equal to the sum of the benefits projected to that year.

(b) Benefits in Pay at the end of 1975

These were available from special tabulations subdivided by age, sex and duration prepared for us by the CPP Division of the Department of Supply and Services. Since the totals were somewhat out of line with known amounts of disability benefits paid in 1975 available from other sources, the data were adjusted to ensure consistency with such amounts.

(c) Probabilities of being insured for disability benefits

Since the main requirement to be insured for disability benefits is to have made contributions in at least five of the last ten years, such probabilities are heavily dependent upon the levels of participation rates in such recent years and, since such probabilities may be higher or lower than such levels depending upon working patterns, it was decided to assume that an individual's probability of being insured for disability benefits in any given year would be equal to the average of the most recent ten participation rates for his age-sex cohort. Sample probabilities are shown below.

Schedule 10

Probability of Being Insured for Disability Benefits

Age	22	25	30	35	40	50	55	60
Males								
1980	0.151	0.606	0.959	0.982	0.972	0.933	0.908	0.851
2050	0.147	0.589	0.927	0.959	0.960	0.926	0.900	0.844
2100	0.147	0.587	0.925	0.958	0.958	0.924	0.899	0.843
Females								
1980	0.113	0.451	0.642	0.566	0.537	0.504	0.464	0.398
2050	0.124	0.497	0.738	0.734	0.753	0.753	0.713	0.640
2100	0.125	0.500	0.743	0.739	0.758	0.762	0.729	0.663

(d) Proportions of earnings insured for disability benefits

Since insured contributors will generally have higher aggregate earnings than uninsured contributors, such proportions should be higher than the probabilities of being insured for disability benefits. Sample values of proportions assumed are shown below.

Schedule 11

Proportion of Earnings
Insured for Disability Benefits

	Age	22	25	30	35	40	50	55	60
Males									
	1980	0.830	0.921	0.991	0.995	0.993	0.983	0.977	0.963
	2050	0.829	0.918	0.984	0.990	0.988	0.970	0.955	0.922
	2100	0.829	0.917	0.983	0.989	0.987	0.970	0.954	0.921
Females									
	1980	0.823	0.890	0.919	0.892	0.884	0.876	0.866	0.849
	2050	0.825	0.899	0.941	0.933	0.926	0.901	0.871	0.820
	2100	0.825	0.900	0.942	0.935	0.927	0.905	0.878	0.831

(e) Disability Incidence Rates

The disability incidence rates used differ slightly different from those used for Statutory Actuarial Report No.6. They were calculated by dividing 1975 emerging disability beneficiaries by the product of the 1975 actual (instead of projected) populations and the assumed 1975 probabilities of being insured for disability benefits. Sample values are as follows:

Schedule 12

Disability Incidence Rates per 1000

Age	Males	Females
25	0.342	0.206
30	0.457	0.310
35	0.758	0.478
40	1.355	0.890
45	2.208	1.680
50	4.542	3.298
55	9.005	6.694
60	17.484	13.505

(f) Disability Termination Rates

Since CPP experience to date has not been sufficiently extensive to yield reliable termination rates, at least at the longer durations, it was decided to continue the use of rates derived from graduated OASDI rates as published in Actuarial Study No. 74 of the U.S. Social Security Administration pertaining to 1968-74 experience under the United States plan; preliminary investigation showed that these rates would not be inappropriate for application to CPP beneficiaries. Sample values are listed below.

Schedule 13

Disability Termination Rates per 1000

		Year of Disability						Attained
	Age	1	2	3	4	5	Ultimate	Age
Males	25	115.9	176.0	105.1	61.3	40.3	29.2	30
	30	116.8	164.3	97.4	58.1	41.1	28.7	35
	35	118.9	158.6	95.5	59.0	43.8	31.0	40
	40	117.4	144.0	88.0	58.1	46.2	35.2	45
	45	120.8	126.6	78.9	57.6	49.4	41.5	50
	50	118.6	109.4	72.8	60.5	56.0	52.6	55
	55	113.3	97.4	71.9	66.3	65.7	64.7	60
	60	102.8	89.6	75.7	74.1	74.5	-	65
Females	25	70.8	98.8	65.3	39.3	26.5	19.2	30
	30	63.1	87.3	58.5	38.3	28.5	22.3	35
	35	68.4	87.7	58.6	39.4	29.6	22.8	40
	40	74.4	90.5	59.4	38.1	29.2	22.6	45
	45	78.9	85.7	55.3	37.2	30.1	25.8	50
	50	75.3	72.7	47.4	35.5	31.7	30.0	55
	55	68.9	61.2	43.9	37.0	35.2	34.4	60
	60	60.6	54.7	43.2	39.0	37.8	-	65

(g) Earnings-related benefit factors

Such factors were developed in a manner similar to that used in the development of retirement benefit factors described in 6 above, multiplied by .75, to allow for the difference in the benefit formula.

(h) Final adjustment

The above procedures and assumptions yield estimated benefits extremely close to actual benefits paid for each of the years 1976 through 1982. However, for 1983 actual benefits exceeded estimated benefits by 6%. It was thought that this might be a temporary aberration associated with the economic recession and that it would wear off in time. Consequently, benefits for 1990 and all subsequent years were estimated in accordance with the above described procedures and assumptions, but for 1983 estimated benefits were replaced by actual benefits, and for years 1984 through 1989 the actual benefits paid in 1983 were graduated into the estimates for 1990. (see 12(b) below)

8. Disabled Contributor's Child's Benefit

(a) General Procedure

(i) It was assumed that all children under age 18 would be entitled to benefits if a parent was in receipt of a disability pension, but that no children over age 18 would be entitled; it was further assumed that parents would not be disabled at the time of a child's birth.

(ii) For quinquennial years and quinary age-groups and each sex separately, adult disability beneficiaries who had become disabled within the last 'n' years (n=5, 10, 15 or 20), were estimated using techniques similar to those described in 7 above for the estimation of flat-rate disability benefits.

(iii) The beneficiaries in (ii) were divided by estimates of the general population 'n' years earlier to obtain probabilities that an individual of given sex and age-group in a given year would become a disability beneficiary within the next 'n' years and survive as such to the end of the 'n' years.

(iv) A percentage age distribution of fathers of new born children (for male contributors) or mothers of new born children (for female contributors) was applied to the above probabilities, to yield probabilities that an 'n' year old child in a given year will have a father or a mother of a given age, as the case may be, who became a disability beneficiary after the birth of the child and who survived as such to the given year.

(v) Summing such probabilities over all ages of the parent yielded the probability that the child would have a parent who is a disability beneficiary in a given year, and therefore the probability that the child would be entitled to a disabled contributor's child's benefit in respect of that parent in that given year.

(vi) Interpolation between the pivotal probabilities for age 'n' of the child developed in (v) yielded probabilities that a 0-4, 5-9, 10-14 or 15-17 year old child in the given year would be entitled to a disabled contributor's child's benefit in respect of a parent of a given sex.

(vii) Applying such probabilities to the projected children's populations yielded disabled contributor's child beneficiaries; the beneficiaries in respect of disabled mothers were then reduced by 5% to allow for the fact that children may not receive benefits in respect of both parents; Lagrange interpolation was used to determine beneficiaries for non-quinquennial years, and beneficiaries were multiplied by the applicable amount of flat-rate benefits to yield benefits.

(viii) Before projecting adult beneficiaries in (ii) above, based on the distribution of existing adult beneficiaries at December 31, 1975, and estimates of future emerging beneficiaries, it was determined that the existing adult beneficiaries at December 31, 1975 were inconsistently high relative to the known child beneficiaries at that time, and that the use of such figures would significantly overstate the number of child beneficiaries in the early years of the projection. Therefore, the existing adult beneficiaries at December 31, 1975 were reduced for consistency with the known number of child beneficiaries at that time.

(ix) The above procedures and assumptions yield estimated benefits somewhat greater than actual benefits paid for most of the years from 1976 to 1982 so that they appear to contain a margin of conservatism which was fully retained after 1989. (see 12(b) below)

(b) <u>Age distribution of parents of new-born children</u>

The distribution of fathers and mothers of new-born children by age was based on data from Vital Statistics for 1965 to 1969 and 1970 to 1974, respectively.

9. Surviving Spouse's Pension

(a) For quinquennial years (after 1980) of first spouse's death, male deaths (for widows' benefits) and female deaths (for widowers' benefits) were derived consistent with our population projections and multiplied by proportions married at death to obtain married deaths. The proportions married at death were derived from actual experience as shown in Vital Statistics for the particular calendar years 1960, 1965, 1970, 1975 and 1980. For the years after 1980, proportions were extrapolated on the basis of these five series of actual values. Sample values are shown below.

Schedule 14

Proportions Married at Death(%)

	MALES			FEMALES		
AGE	1975	2000	2015+	1975	2000	2015+
20-24	19	13	13	35	18	18
25-29	49	30	30	59	46	45
30-34	62	55	54	72	55	54
35-39	68	62	62	75	62	62
40-44	73	63	63	77	68	68
45-49	75	67	67	79	76	76
50-54	76	68	68	76	74	74
55-59	77	74	74	70	71	71
60-64	77	76	76	63	62	62
65-69	75	77	77	52	51	51
70-74	70	74	74	40	41	41
75-79	65	70	70	28	27	27
80-84	55	63	64	19	16	16
85-89	42	58	59	10	10	10
90+	29	33	33	4	3	3

(b) To determine numbers of emerging widows and widowers for flat-rate benefit purposes, married deaths were multiplied by an estimated probability of the deceased spouse being insured for the spouse's benefit, based on participation rates during his/her contributory period.

(c) For earnings-related benefit purposes, married deaths were multiplied by earnings-related benefit factors, developed by a procedure similar to that used for retirement benefit factors described in 6 above. Theoretically, as for disability benefits, they should also be multiplied by proportions of earnings insured for spouse's benefits. However, since the coverage requirements are less severe than those for disability benefits, it was felt that such proportions would be close to unity and that this refinement was not necessary.

(d) Both numbers of insured married deaths and emerging earnings-related benefits were then distributed by age of surviving spouse using relative age distributions of husbands and wives as derived from the 1976-80 experience under the Plan.

(e) Comparisons of actual benefits that emerged during the 1976-80 period with those estimated to emerge using the above techniques indicated that for that period at least, our procedures and assumptions tend to overestimate benefits emerging. There may be several reasons for this. For example, we made no allowance for considerations such as (i) the mortality of married contributors possibly being lighter than general population mortality, (ii) the fact that not all eligible survivors

apply for benefits, and (iii) the non-entitlement or the reduced entitlement to benefits of survivors under age 65 because of the absence of children and disability while the survivor is under age 45. However, it was also felt that the importance of some of these factors would diminish with time. Consequently, it was decided to reduce our estimates of benefits emerging, determined by the above methods, by application of the following factors varying by sex, type of benefit and year of emergence:

Schedule 15

	Widows		Widowers	
Calendar Year	Flat-rate	Earnings-related	Flat-rate	Earnings-related
1985	0.90	0.85	0.60	0.45
1990	0.95	0.90	0.65	0.50
1995	1.00	0.95	0.70	0.55
2000+	1.00	0.95	0.75	0.60

(f) These quinquennially emerging surviving spouses and their earnings-related benefits were then projected to quinquennial years using mortality and remarriage as causes of decrement.

For widows, rates of remarriage were assumed in accordance with the rates described in the paper "Remarriage Experience under the Pension Act of Canada" (Transactions of the Society of Actuaries, Volume XII), rates that were based on the 1940-1957 experience and that are somewhat lower than those which have been experienced across Canada in more recent periods and consequently may result in some overstatement of widows' benefits.

For widowers, rates of remarriage were developed from some rather scanty data available in the Vital Statistics publications and were adjusted so as to produce approximately the same proportionate overstatement in benefits as the rates used in the valuation of widows' benefits.

(g) Survivors under age 65 were multiplied by flat-rate benefit factors, and both earnings-related benefits and flat-rate benefits were increased by the required Pension Index escalation.

(h) For surviving spouses over age 65 entitled to a retirement benefit, there is a limit on the combined surviving spouses' and retirement pensions available, inferior to the sum of the two pensions. Since the full retirement pension is assumed to be payable in our estimates of retirement pensions, estimates of surviving spouses' pensions had to be reduced to take into account this limit. The required reductions were estimated on the basis of rough hypothetical distributions of surviving spouses' and retirement pensions around their mean value.

Surviving spouses under age 65 who are also entitled to disability pensions are subject to a similar limit on their combined pensions, but this was ignored.

(i) The foregoing steps produce earnings-related benefits and flat-rate benefits for each quinquennial calendar year following each quinquennial year of widowhood after 1980. By interpolation between the figures for quinquennial years of widowhood and summation of the results, benefits were obtained for all quinquennial years following each quinquennial year of widowhood after mid-1980 combined. Benefits actually in pay in mid-1980 were projected to such quinquennial years using the mortality and remarriage factors mentioned in (f) and making due allowance for Pension Index escalation and the change in benefit formula at age 65. These were then added to the survivors of

subsequently emerging benefits to obtain total benefits in pay in quinquennial attained years. Lagrange interpolation between these results yielded benefit estimates for the remaining attained years.

10. Orphan's Benefit

(a) General Procedure

(i) It was assumed that all children under age 18 of deceased insured parents would be entitled to benefits, but that no children over age 18 would be entitled.

(ii) Age distributions of fathers and mothers of new-born children were projected 'n' years (n=5, 10, 15 or 20) to determine probabilities that a child has a deceased father, or mother, who would have belonged to a certain age-group if he or she had survived. Such probabilities were reduced for early years of the Plan to exclude the probability of dying before January 1, 1968 since such deaths would not have been insured.

(iii) The probabilities developed in (ii) were multiplied by the proportions of parents insured for orphans' benefits at date of death, taken as a uniform .98 for fathers but varying according to year and age at death for mothers (the year and age at death were assumed to be at the mid-point of the period of exposure to death inherent in the probabilities developed in (ii) above. The proportions of mothers insured for orphans' benefits are as follows:

Age Group	1975	2000	2025	2050
20-24	72	77	77	77
25-29	68	82	82	82
30-34	61	80	81	81
40-44	45	78	80	80
50-54	45	73	78	78
60-64	36	63	75	75

(iv) The probabilities as adjusted in (iii) above, summed over all ages of the parent, yield the probability that a child age 'n' in a particular year would be entitled to orphan's benefits. Interpolation between those pivotal values yielded probabilities that children aged 0-4, 5-9, 10-14, or 15-17 in that year would be entitled to orphans' benefits in respect of a parent of a given sex. Such probabilities, when applied to the projected children's population, yielded orphan beneficiaries. The orphan beneficiaries in respect of female contributors were reduced by five percent to allow for the fact that a child cannot simultaneously receive benefits in respect of both of his parents. Since the calculations had been carried out for quinquennial years only, Lagrange interpolation was used to obtain beneficiaries for other years. Benefits were determined by multiplying beneficiaries by the flat-rate amount of benefit adjusted in accordance with the Pension Index.

(v) Benefits projected for the early years following the valuation date by the above procedures turned out to be unreasonably high in comparison with benefits that have been paid in recent years and were reduced to allow for recent experience. However, it is likely that the long-run estimates will also turn out to have a considerable margin of conservatism. (see 12(b) below)

(b) Age distribution of fathers and mothers of new-born children

The distributions of fathers and mothers of new-born children by age were based on data from Vital Statistics for 1958 to 1962 and 1966 to 1970 respectively.

11. Death Benefit

Estimated deaths were multiplied by earnings-related benefit factors developed by a procedure similar to that used for retirement benefit factors described in 6 above, but representing the value of half a year's instead of a full year's pension payment. The resultant death benefit estimates were reduced to allow for the fact that the death benefit cannot exceed 10% of the YMPE for the year of death. In addition, since it was found that estimates for years shortly following the effective date of this report exceeded benefits that could be expected to be paid on the basis of recent experience, short-run estimates were further reduced to bring them into line with what might be reasonably expected. (see 12(b) below)

12. Split of Pensionable Earnings on Divorce or Annulment of Marriage, Child Rearing Drop-out and Final Adjustments

(a) The assumptions described above were used for making estimates without taking into account the plan provisions for (i) an equal split between spouses of pensionable earnings credits during their marriage upon application by either spouse after termination of the marriage by divorce or annulment and (ii) the option to drop out years of earnings during which a contributor had care of a child under age 7 in determining benefit amounts if to the advantage of the contributor.

Sets of adjustment factors were developed and applied to benefits as determined above to take into account both of these provisions.

For the first of these provisions, a second set of estimates was made assuming that total pensionable earnings of both spouses earned during their marriage would be split equally between them on a year-to-year basis in all cases.

Adjustment factors were then based on the assumption that estimates should reflect 9/10 (14/15 for spouses' benefits) of the figures generated by the first set of estimates, plus 1/10 (1/15 for spouses' benefits) of the figures generated by the second set of estimates.

For the second of these provisions, earnings-related benefits payable in respect of female contributors were increased by adjustment factors to allow for the child rearing drop-out provision. These adjustment factors were calculated as follows:

(i) It was assumed that the average female would have two children, separated two years in age, so that she would be potentially eligible for nine additional years of drop-out, representing approximately 20% of her contributory period.

(ii) It was estimated that in the long-run retirement benefits for females would be increased 17% if the regular drop-out provision were increased from 15% to 35%. It was felt that this would overstate the effect of the child rearing drop-out provision in that a modification in the regular drop-out provision from 15% to 35% would permit dropping out an additional 20% years of lowest earnings while the child rearing drop-out provision only permits dropping out the actual years of care of children which may not be those of lowest earnings. It was decided to assume that the child rearing drop-out provision would have only half the effect of a modification in the regular

drop-out provision from 15% to 35%, i.e., would increase female retirement benefits in the long-run by 8.5%.

(iii) In the short-run, the effect on retirement benefits would be much less, e.g., it would be very small for a female aged 40 at the inception of the Plan since she would be unlikely to have years of child rearing in her contributory period. Consequently, the 8.5% increase in female retirement benefits, assumed applicable from 2025 onwards, was graded down to much lower percentages for earlier years.

(iv) While the effect on other earnings-related benefits is not identical to that on retirement benefits, nevertheless for simplicity and because of their relative unimportance, the factors developed for female retirement benefits were also applied to other earnings-related benefits in respect of female contributors.

The split of pensionable earnings credits on marriage termination has an effect on benefits varying according to their categories, particularly subdivisions by sex of contributor, but it has very little effect on the aggregate level of benefits, and for such purposes might well have been ignored .

The adjustment factors for the Child Rearing Drop-out provision, which we assumed would apply only in respect of benefits attributable to female contributors, have a much more significant effect on the aggregate level of benefits, and of course operate so as to increase that level.

(b) The actual expenditures for 1983 were known before completion of this report, and it appeared that total actual expenditures excluding surviving spouses' benefits exceeded projected expenditures by about 0.8% in aggregate. However, it was decided to replace the 1983 projected values by actual values and to replace the projected values to 1989 inclusive by values which produce differences gradually decreasing to zero in 1990.

13. Fund Projections

(a) The Fund, for the purpose of this report, is assumed to be the amount to the credit of the Canada Pension Plan Account.

(b) Annual investments in provincial bonds prior to 1983 are known, but for various reasons are less in total than the amount to the credit of the Canada Pension Plan Account at December 31, 1982. They were adjusted proportionately so as to match the said credit.

(c) The annual amounts of interest earned on each year's investments made prior to 1983 are also known, and were adjusted in proportion to the adjustment in the investments.

(d) Amounts invested in each future year were taken as equal to contributions for the year minus benefits for the year plus one year's interest on outstanding investments plus prior investments matured during the year.

(e) Each future year's investments are assumed to earn interest until maturity at the annual rate of interest on new investments postulated in the economic assumptions for the year of investment.

(f) Normally, investments are assumed to mature after 20 years. However, if the amount to be invested in any year, calculated by the formula in (d), and assuming 20-year maturities, should turn out to be negative, it is necessary to assume additional maturities in that year sufficient to provide a positive investment. Otherwise, there would not be sufficient funds released in that year to pay benefits. Such additional maturities were assumed to be on a last-in, first-out basis.

(g) The Fund at the end of any year was taken as the sum of the outstanding investments.

14. Entry-Age Normal Actuarial Cost and Related Unfunded Actuarial Liability (also discussed in Appendix C)

(a) Entry-Age Normal Actuarial Cost (current service contribution rate)

This was determined by estimating contributory earnings and benefits and expenses in respect of the quinary age-group cohort centered around age 18 on December 31, 1982, and determining by an iteration process, and using our usual fund accumulation methods, the contribution rate that would be exactly sufficient to accumulate a nil fund in respect of that cohort at the expiration of all contributions and expenditures in respect of that cohort. The entry-age normal actuarial cost was taken to be the contribution rate so determined.

(b) Unfunded Actuarial Liability

An amount A, hypothetically invested in 1983, was determined by an iteration process such that together with (i) the fund at December 31, 1982, (ii) future (post-1982) contributions at the entry-age normal actuarial cost rate collected in respect of the population aged 18 and over on December 31, 1982 and (iii) investment earnings, it would be just sufficient to pay all future benefits and administrative expenses in respect of those aged 18 and over on December 31, 1982. The unfunded actuarial liability at December 31, 1982 was taken as the amount A discounted for one-half year's interest.

Appendix C

ESTIMATES OF CONTRIBUTION RATES BASED ON "ACTUARIAL FUNDING" AND DEVELOPMENT OF RELATED "UNFUNDED ACTUARIAL LIABILITY"*

Application of the principles of "actuarial funding" (which are the cornerstone of security for private pension plans) is usually considered inappropriate in the field of social insurance for a number of reasons:

A. It does not seem possible to provide greater security of benefits through funding in the usual sense, because a country cannot divest itself of its pension obligations, unless it were to export the required capital and such export did not itself constitute a reduction in security.

B. The actuarial funding of national pensions would tend to concentrate overwhelming control of capital in the hands of governments or their agencies.

C. It does not seem possible to determine (outside of a controlled economy) to what extent actuarial funding would result in higher total savings and greater intergenerational equity than would otherwise exist.

D. Although it may be possible and desirable to complement the benefit load (reflecting the entire non-productive population) with a varying level of investment designed to enhance future productivity, there appears to be no way to level out the impact of benefit payments on the economy.

E. Since social insurance benefits are normally payable in a manner approximating maintenance of real benefit levels, accumulated funds would need to be maintained in real terms; this would necessitate issuance of a huge volume of indexed bonds or similar securities.

Notwithstanding the above, it is interesting and informative to calculate the level of the contribution rate that might be considered appropriate, if the benefits provided by the Canada Pension Plan were to be funded by means of a normal pension trust. Moreover, the Auditor General of Canada suggested in 1977 that information based on principles of "actuarial funding" be made public, and accordingly such information was included with Statutory Actuarial Report No.6.

The rates of contribution quoted in this appendix were developed by the entry-age normal actuarial cost method, which aims at a level percentage of contributory earnings to be contributed during the active lifetime of a normal cohort of entrants, sufficient to support all benefits payable to them and their beneficiaries.

For several reasons contribution rates according to the entry-age normal actuarial cost method exhibit characteristics quite different from those of the pay-as-you-go rates presented in the body of this report (see Table 3 and "Fund B" rates), as indicated in the following table:.

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* For additional details on methodology and assumptions see preceding page

Parameter changed	Effect on CPP Contribution Rate	
	Pay-as-you-go	Entry-age normal
(i) Real rate of increase in earnings	varies inversely	may vary directly or inversely depending on net effect of change in real interest rate, change in effective deferred period discount (interest rate less rate of earnings increases), and level of inflation
(ii) Interest rate	independent	varies inversely, other things being equal (see (i) above)
(iii) Fertility	varies inversely	negligible (affects only volume of children's benefits)
(iv) Immigration	varies inversely	varies directly

The concept of an entry-age normal actuarial cost (contribution rate) engenders the concept of an unfunded actuarial liability arising out of the lack of contributions prior to the inception of the plan, the collection of contributions since the inception of the plan at a rate inferior to the entry-age normal rate and several other less significant sources.

As described on page 64, the unfunded actuarial liability is calculated as the amount which would theoretically be required to be invested in the year following the valuation date and is therefore extremely sensitive to the rate of interest assumed applicable for that year. For example, if there is a drop in interest rates, all other things being equal, the unfunded liability would appear to have increased very substantially in the following year, merely because the amount of the unfunded liability was not invested during a year of high interest rates. In order to avoid such somewhat artificial fluctuation, it was decided (in contrast to Statutory Actuarial Report No. 6) to base the calculations for purposes of this Appendix on the ultimate economic assumptions only. The effect on the entry-age normal actuarial cost is rather small (e.g., if all the economic assumptions used for the Main Tables were used, the contribution rate shown for basis A in the table below would be 7.55% instead of 7.79%) and the use of only ultimate assumptions for this purpose could be rationalized in any event since an "ultimate" contribution rate is desired. However, the effect on the unfunded actuarial liability is very substantial (e.g. the use of all the economic assumptions used for the Main Tables would produce an amount of $102 instead of $191 billion for basis A).

The unfunded actuarial liability may be expected to grow substantially (i) by the amount of interest not earned thereon and (ii) by the difference between contributions at the hypothetical entry-age normal actuarial cost rate and contributions actually collected and by interest not earned on this difference. Thus, for example, the estimated unfunded actuarial liability of $191 billion shown below on basis A as at December 31, 1982 may be expected to increase to $208 billion by December 31, 1983. Strictly speaking, the unfunded actuarial liability may be considered to be slightly understated, because the entry-age normal actuarial cost assumed payable in the future by the existing population aged 18 and over is somewhat overstated, since mortality and female participation rates are designed for the cohort aged 16 to 20, at December 31, 1982.

The results of our calculations are as follows:

Basis	Economic Assumptions**			Entry Age Normal Actuarial Cost	1982 Unfunded Actuarial Liability
	Increase in CPI (%)	Increase in Earnings (%)	Interest on New Bonds (%)	(%)*	($ billions)
A	3.5	5.0	6.5	7.79	191
B	4.0	5.0	6.5	8.22	198
C	3.5	5.0	6.0	9.13	210
D	3.5	5.5	6.5	8.65	193
E	3.0	5.0	6.5	7.40	186
F	6.0	8.0	8.5	10.03	208

It might be added that the liquidation of the unfunded actuarial liability is unlikely to be advocated because as indicated above, such a course, would enhance neither the security of benefit payments nor intergenerational equity.

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* Percent of contributory earnings.

** The assumptions shown for A, B and C are the ultimate assumptions used for Tables 1, 10, and 6, respectively. The assumptions in D are the ultimate assumptions of Statutory Actuarial Report No. 6, those in E are the ultimate assumptions used for purposes of the Federal Task Force on Retirement Income Policy (1979) and the 1982 Green Paper "Better Pensions for Canadians" and those in F were adopted by the Business Committee on Pension Policy in its 1983 Cost Study of Pension Reform Proposals. All other relevant assumptions are those used for purposes of the Main Tables and described in Appendix B.