

Public Service Superannuation Act - Part I

Report on Actuarial Examination
of the
Superannuation Account in the Consolidated Revenue Fund
as at December 31, 1967

In accordance with instructions and pursuant to section 33 of the Public Service Superannuation Act, we have completed an actuarial examination of the Superannuation Account in the Consolidated Revenue Fund and have the honour to report thereon.

The report has been divided into seven sections, as follows:

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I. TERMS OF THE SUPERANNUATION PLAN AS AT DECEMBER 31, 1967

Recent Amendments

The last examination of the Account was made as at December 31, 1962. Since that time a number of changes have been made in the provisions of the Public Service Superannuation Act. The most significant of these changes were included in the 1966 amendments to the Act which provide, among other things, for the following:

- (a) Contributions are subject to a reduction essentially equal to the contributions required by the Canada Pension Plan*, so that the total amount of pension contributions payable

* In this report, references to the Canada Pension Plan should be read as including the Quebec Pension Plan.

by contributors remained for practical purposes unchanged; however, in contrast to the Public Service Superannuation Act, contributions to the Canada Pension Plan are not limited to thirty-five years.

- (b) Annuities payable to retired contributors are subject to a reduction, to be made at the time when pension benefits are payable under the Canada Pension Plan; the reduction is based on pensionable service after December 31, 1965, and on an average salary not exceeding the maximum of the Canada Pension Plan.
- (c) A contributor who terminates employment after attainment of age forty-five and completion of ten years of pensionable service becomes entitled to a mandatory deferred annuity in respect of service after September 30, 1967; with respect to earlier service, contributors retain the option of a deferred annuity or a return of contributions.

The amendment described in (c) above was made to bring the provisions of the Act into line with the uniform pension benefits legislation enacted by the provinces of Ontario, Quebec, Alberta and Saskatchewan and embodied in the Pension Benefits Standards Act in respect of pension plans covering employment under federal jurisdiction.

(The Act was further amended in 1969, to provide for the extension of children's allowances from age eighteen to age twenty-five, provided the child (i) is in full-time attendance at a school or university, (ii) has been in such attendance substantially without interruption since attainment of age eighteen, and (iii) is unmarried. This legislation also provides that a widow's allowance which has been suspended because of remarriage will be reinstated upon annulment or dissolution of the widow's marriage. These amendments are not reflected in this report on the examination as at December 31, 1967.)

Coverage

With few exceptions, the Public Service Superannuation Act applies to every full-time employee in the Public Service who has attained age eighteen and is in receipt of an annual salary of nine hundred dollars or more.

The term Public Service as used in this Act includes not only departments of the federal government but many boards, commissions and corporations listed in a Schedule to the Act as well as, for example, positions in the Senate and the House of Commons.

Prevailing rate, seasonal and short-term employees are required to become contributors after completion of six months of substantially continuous service. Persons engaged as sessional employees, postmasters or assistant postmasters in revenue post offices and some others, may be designated as contributors by the Minister either individually or as members of a class.

The main groups of persons employed in the Public Service to which the Act does not apply are part-time employees, persons engaged locally outside Canada and employees covered by other pension plans as is the case in many Crown corporations.

The Act provides benefits for two main groups of persons

- (a) former employees of the Public Service who have become entitled to lump sum payments, annuities or annual allowances payable out of the Superannuation Account; and
- (b) widows and children who have become entitled to annual allowances payable out of the Superannuation Account, that is, dependants of contributors who died either in service or while entitled to an annuity or annual allowance.

Pensionable Service

The amount of any annuity to which a contributor may become entitled under the Act depends upon the number of years of pensionable service to his credit at the date he ceases to be employed in the Public Service.

"Pensionable service" is described in detail in the Act. Very generally, the pensionable service of a contributor includes any period of service in the Public Service for which he has contributed or has elected to contribute and has been eligible to do so. It may also include, for example,

- (a) one-half of a period of service in the Public Service before August 11, 1939, for which the contributor neither made nor elected to make contributions,
- (b) a period of active service in the forces during World War I or World War II or with the Korean Special Force,
- (c) a period of service with the regular forces, with the Royal Canadian Mounted Police or with an employer with whom a reciprocal transfer agreement has been effected,
- (d) a period of service with the Government of Newfoundland prior to the union of Newfoundland with Canada, and
- (e) a period of service in pensionable employment prior to becoming employed in the Public Service.

Summary of Benefits

(a) Contributors with less than five years of pensionable service:

Subject to a few exceptions, the only benefit to which a contributor in this category is entitled is a "return of contributions" (Note 1).

(b) Contributors with five or more years of pensionable service:

(i) Contributors employed in the Public Service

<u>Contingency</u>	<u>Benefit</u>
Retirement because of age (Note 2)	Immediate annuity (Note 3).
Retirement because of disability (Note 2)	At option of contributor (Note 8): A. immediate annuity (Note 3); B. cash termination allowance (Note 4) or return of contributions, whichever is greater.
Termination for reasons other than age, disability, misconduct or death (Note 2)	At option of contributor (Note 8): A. return of contributions; B. deferred annuity (Note 5); or C. annual allowance (Note 6), if he has twenty years of pensionable service or otherwise with the consent of the Minister.

<u>Contingency</u>	<u>Benefit</u>
Dismissal because of misconduct	A. Return of contributions; or B. with the consent of the Treasury Board; immediate annuity, deferred annuity or annual allowance (Note 7).
Death leaving no widow or children under age 18*	Return of contributions to estate.
Death leaving widow or children under age 18*	Annual allowance (Notes 9 to 11).

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

<u>Contingency</u>	<u>Benefit</u>
Death leaving no widow or children under age 18*	Return of residual amount of contributions to estate (Note 10).
Death leaving widow or children under age 18*	Annual allowance (Notes 9 to 11).

Note 1:

"Return of contributions" means return of a contributor's total current service and prior service contributions without interest.

Note 2:

Although employment normally ceases about age sixty-five, "retirement because of age" in this summary means ceasing to be employed in the Public Service at age 60 or over for any reason other than misconduct or death. It follows that "retirement because of disability" refers only to retirement before age 60, and that "termination for reasons other than age, disability, misconduct or death" refers only to termination before age 60.

Note 3:

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

When the contributor reaches the age or condition of disability that would entitle him to a pension under the Canada Pension Plan or the Quebec Pension Plan, the above basic annuity is reduced by 0.7% of average

* As noted on page 2 the 1969 amendments to the Act provided for the continuation of children's allowance to age twenty-five under certain conditions.

salary multiplied by the number of years of pensionable service after 1965 that are counted in the calculation of the basic annuity. However, for purposes of calculating the reduction, the average salary cannot be taken as more than the "Average Maximum Pensionable Earnings". The latter is the average of the "Year's Maximum Pensionable Earnings", as defined in the Canada Pension Plan, for the year in which the reduction is made and the two preceding years.

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

Note 4:

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

Note 5:

"Deferred annuity" means an annuity that becomes payable to a contributor at age 60. The annual amount of annuity is computed as described in Note 3.

If a contributor who has become entitled to a deferred annuity becomes disabled before attaining age 60, he ceases to be entitled to that deferred annuity and becomes entitled to an immediate annuity.

Note 6:

"Annual allowance" to a contributor means an allowance payable immediately in the case of a contributor of age 50 or over, or payable at age 50 in the case of a contributor of age less than 50. The annual allowance is computed in accordance with regulations as the actuarial equivalent of the deferred annuity described in Note 5 on the basis of the $\alpha(f)$ and $\alpha(m)$ Ultimate tables of mortality and interest at 4% per annum.

If a contributor who has become entitled to an annual allowance payable at age 50 becomes disabled before attaining age 60, he ceases to be entitled to that annual allowance and becomes entitled to an immediate annuity, but an actuarial adjustment is made in respect of payments received prior to the disability.

Note 7:

In the case of dismissal because of misconduct, the Treasury Board has the power to specify that the contributor become entitled to the whole or any part of the annuity or annual allowance to which he would have become entitled if he had ceased to be employed in the Public Service for a reason other than misconduct. However, the annuity or annual allowance cannot be reduced to the extent that its capitalized value, computed in accordance with regulations on the basis of the $\alpha(f)$ and $\alpha(m)$ Ultimate tables of mortality and interest at 4% per annum, is less than the contributor's own contributions.

Note 8:

The right of the contributor to select the "return of contributions" benefit is limited if on termination of employment he has attained age forty-five and has to his credit ten years of pensionable service. In such a case, an annuity or annual allowance benefit would be mandatory in respect of service after September 30, 1967, and any other benefit selected by the contributor would be payable only in respect of earlier service.

Note 9:

"Annual allowance" to the widow of a contributor means one-half of the annual amount of "basic annuity" computed as described in Note 3. This is termed the "basic allowance". If the age of the contributor exceeds that of the widow by twenty or more years, the widow's allowance is reduced. If a contributor dies within one year after his marriage, no allowance is payable to the widow, if the Minister is not satisfied that at the time of his marriage the state of health of the contributor was such as to justify him in having an expectation of surviving for at least one year thereafter. If a widow remarries, her allowance is (a) suspended during the period of remarriage, or (b) forfeited, if she receives, upon her request, a return of contributions less all payments made to the contributor, widow and children (such request can only be made during the period of remarriage and if there is no child of the contributor entitled to an annual allowance under this Act).

"Annual allowance" to each child of a deceased contributor means one-fifth of the basic allowance, or, if there is no living widow of the contributor, two-fifths of the basic allowance. The allowance is payable until the child reaches age 18*. The total amount of allowances payable to the children of a deceased contributor may not exceed four-fifths of the basic allowance, or, if there is no living widow, eight-fifths of the basic allowance. A child born to the widow of a contributor is not entitled to an annual allowance unless the child was conceived before the death of the contributor.

Note 10:

At the time that (a) a contributor dies leaving no widow or children entitled to an allowance, or (b) a contributor's last dependant to whom an allowance is payable dies or otherwise ceases to be entitled thereto, any amount by which the amount of a return of contributions exceeds the aggregate of all amounts that have been paid to the contributor, his widow and his children, is paid to the contributor's estate, or, if less than five hundred dollars, as authorized by the Minister.

Note 11:

The allowances payable are computed in the manner and subject to the conditions described in Note 9. However, the widow of a contributor is not entitled to an annual allowance if the contributor married after he became entitled to an annuity or annual allowance payable out of the Superannuation Account and did not subsequently become employed in the Public Service. Also, a child who was born to or adopted by a contributor or who became the stepchild of a contributor after the contributor ceased to be employed in the Public Service is not entitled to an annual allowance unless, in the case of a child born to a contributor, the child was conceived before the contributor ceased to be so employed.

* See footnote on page 5.

Contributions:

By Contributor -

(a) Current Service

The rates of contribution for contributors employed in the Public Service are

- (i) for males, $6\frac{1}{2}\%$ of salary, and
- (ii) for females, 5% of salary,

reduced by a percentage, equal to the rate of contributions required by the Canada Pension Plan, applicable to the amount of salary between the lower and upper contributory earnings limits of the Canada Pension Plan. (For example, in 1968, the year beginning with the date of this examination, the reduction was 1.8% of salary between \$600 and \$5,100 per annum.)

Contributions cease after a contributor has to his credit 35 years of contributory service. By "contributory service" is meant all pensionable service in respect of which contributions have been made or have been elected to be made as well as any period of absence from the Public Service on active service in the forces during World War I or World War II that is countable as pensionable service but for which contributions are not required.

(b) Prior Service

A contributor may elect to contribute in respect of any period of pensionable service served prior to becoming a contributor.

In general, if election for a period of pensionable service is made within one year after the employee becomes a contributor, the amount of contributions required is equal to the total contributions that would have been made during that period of service at the rate of contribution applicable for current service at that time, together with interest*. There are exceptions to this general rule. For example, the amount of contributions required from a contributor in respect of

- (i) active service in the forces in World War I or World War II where the contributor was not employed in the Public Service immediately prior to enlistment in the forces, or
- (ii) service in pensionable employment immediately prior to becoming employed in the Public Service,

is equal to twice the amount that would have been required in respect of a salary at the rate authorized to be paid to the contributor at the time he became employed in the Public Service subsequent to the period of prior service for which he has made election.

A contributor who fails to make an election for a period of pensionable prior service within one year after becoming a contributor may make election for that period of service at any time before he ceases to be employed in the Public Service if he is in good health at date of election. However, the amount of contributions required in respect of such period of service is equal to the amount that would have been required in respect of a salary at the rate authorized to be paid to the contributor at the time he makes election, together with interest.*

* Simple interest at 4% per annum from the middle of the fiscal year in which contributions would have been made, had the contributor been required to make those contributions during the period for which he elects to pay, until the time of making the election.

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

By Government -

The Government in its role of employer credits the Account with amounts matching employee contributions, as well as with such amounts as may be required to meet increased liabilities resulting from increases in salary applicable to groups of employees or as may be required to liquidate actuarial deficiencies revealed in quinquennial examinations.

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

In its role as custodian of the Account, the Government credits the Account with amounts representing interest on the balance from time to time. Up to the effective date of the current valuation (December 31, 1967) such credits were made at the rate* of 1% of the balance to the credit of the Account at the end of the preceding quarter.

* In 1969, the Act was amended to provide that amounts representing interest on the Account would be credited (i) at the rate assumed in the preceding actuarial valuation and (ii) at such supplementary rate as might be provided by regulation. However, provision was also made that any deferred charges due in the same year in respect of actuarial deficiencies would be offset against any supplementary interest.

II. DESCRIPTION OF DATA AND MEMBERSHIP STATISTICS

Most of the basic information necessary for the statutory periodic examinations of the Account is maintained by the Superannuation Branch of the Department of Supply and Services on punched cards designed for the purpose. For the current examination, files of punched cards were provided for

- (a) contributors employed in the Public Service on December 31, 1967,
- (b) contributors who ceased to be employed in the Public Service from January 1, 1963, to December 31, 1967, inclusive,
- (c) contributors entitled to an annuity or annual allowance on December 31, 1967,
- (d) contributors entitled to an annuity or annual allowance who died or became re-employed in the Public Service from January 1, 1963, to December 31, 1967, inclusive,
- (e) widows of deceased contributors entitled to an annual allowance on December 31, 1967,
- (f) widows of deceased contributors who ceased to be entitled to an annual allowance by reason of death or remarriage from January 1, 1963, to December 31, 1967, inclusive, and
- (g) children of deceased contributors entitled to an annual allowance on December 31, 1967, and children who ceased to be entitled to an annual allowance by reason of death or attainment of age 18 from January 1, 1963, to December 31, 1967.

In addition to the information maintained and provided by the Superannuation Branch, further data were required for the examination, namely, annual rates of salary of contributors employed in the Public Service as at December 31, 1967, and total contributions paid by contributors to December 31, 1967. These data, which were prepared by the paying agencies, were merged with the data provided by the Superannuation Branch into a single tape file by matching social insurance numbers.

All programming and processing of the basic data was done in the General Analysis and Programming Division of the Department of Supply and Services. As in the preceding actuarial examination, most of the massive volume of calculations relating to contributors described in (a) and (b) above was carried out on electronic data processing equipment.

In the following tables are shown pertinent statistics derived from the tabulations of the data for the period from January 1, 1963, to December 31, 1967:

Contributors Employed in the Public Service

	Contri- butors on Jan. 1, 1963	Entrants during the 1963-67 period	<u>Terminations during the 1963-67 period</u>				Contri- butors on Dec. 31, 1967	
			Less than 5 years of pension- able service	Five or more years of pensionable service				
			Age (1)	Death	Dis- ability (2)	Other (3)		
Males	127,725	80,978	32,729	9,933	2,643	1,247	9,566	152,585
Females	<u>42,918</u>	<u>46,804</u>	<u>26,113</u>	<u>2,810</u>	<u>287</u>	<u>564</u>	<u>6,168</u>	<u>53,780</u>
Total	<u>170,643</u>	<u>127,782</u>	<u>58,842</u>	<u>12,743</u>	<u>2,930</u>	<u>1,811</u>	<u>15,734</u>	<u>206,365</u>

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- (1) Contributors who retired with entitlement to an immediate annuity at age 60 or over.
 - (2) Contributors who ceased to be employed at ages under 60 because of disability. (The benefit received was either an immediate annuity, a cash termination allowance, or a return of contributions, with annuities accounting for about 85% of the cases.)
 - (3) Contributors who ceased to be employed at ages under 60, for reasons other than death or disability. (Subject to the restriction described in Note 8 on page 7, the benefit was either a return of contributions, a deferred annuity or an annual allowance equivalent in value to the deferred annuity. Between 85% and 90% of all such contributors elected to take the return of contributions benefit, the proportion ranging from over 90% for both males and females in the younger age groups to slightly over 60% for males and slightly over 40% for females in the age group 55 to 59.)

Persons Entitled to an Annuity or Annual Allowance

	<u>Contributors</u>					<u>Entitled</u>		
	<u>Entitled</u> <u>Jan. 1,</u> <u>1963</u>	<u>Who became</u> <u>entitled</u> <u>during the</u> <u>1963-67</u> <u>period</u>	<u>Who ceased to be entitled</u> <u>during the 1963-67 period</u>			<u>Dec. 31, 1967</u>		
			<u>Died</u>	<u>Re-employed</u> <u>or recovered</u>	<u>Other*</u>	<u>In</u> <u>Pay't</u>	<u>Deferred</u>	<u>Total</u>
<u>Males</u>								
Entitlements for reasons other than disability	19,323	11,854	5,814	44	31	23,293	1,995	25,288
Entitlements because of disability	<u>2,281</u>	<u>1,149</u>	<u>876</u>	<u>12</u>	<u>-</u>	<u>2,542</u>	<u>-</u>	<u>2,542</u>
Total	<u>21,604</u>	<u>13,003</u>	<u>6,690</u>	<u>56</u>	<u>31</u>	<u>25,835</u>	<u>1,995</u>	<u>27,830</u>
<u>Females</u>								
Entitlements for reasons other than disability	3,788	3,758	598	18	26	5,841	1,063	6,904
Entitlements because of disability	<u>739</u>	<u>528</u>	<u>168</u>	<u>3</u>	<u>-</u>	<u>1,096</u>	<u>-</u>	<u>1,096</u>
Total	<u>4,527</u>	<u>4,286</u>	<u>766</u>	<u>21</u>	<u>26</u>	<u>6,937</u>	<u>1,063</u>	<u>8,000</u>
Grand Total	<u>26,131</u>	<u>17,289</u>	<u>7,456</u>	<u>77</u>	<u>57</u>	<u>32,772</u>	<u>3,058</u>	<u>35,830</u>

Widows

<u>Entitled</u> <u>Jan. 1,</u> <u>1963</u>	<u>Who became</u> <u>entitled</u> <u>during the</u> <u>1963-67</u> <u>period</u>	<u>Who ceased to be entitled</u> <u>during the</u> <u>1963-67 period</u>		<u>Entitled</u> <u>Dec. 31,</u> <u>1967</u>
		<u>Died</u>	<u>Remarried</u>	
11,755	7,220	2,146	474	16,355

Children

<u>Entitled</u> <u>Jan. 1,</u> <u>1963</u>	<u>Who became</u> <u>entitled</u> <u>during the</u> <u>1963-67</u> <u>period</u>	<u>Who ceased to be entitled</u> <u>during the</u> <u>1963-67 period</u>		<u>Entitled</u> <u>Dec. 31,</u> <u>1967</u>
		<u>Died</u>	<u>Att'd age 18</u>	
2,575	3,168	1	2,096	3,646**

* Contributors who ceased to be entitled to deferred annuities upon becoming entitled to disability annuities.

** This figure includes 41 children of female contributors of whom six were full orphans; of the remaining 3,605 children of male contributors 35 were full orphans.

III. VALUATION BASES AND ASSUMPTIONS

1. General

With a few exceptions, the bases and assumptions used for the actuarial examination as at December 31, 1962, were deemed to be satisfactory for purposes of the examination as at December 31, 1967. The only changes made were in the following:

- (a) select rates of termination for all reasons (less than five years of service), for males,
- (b) rates of termination for reasons other than age, disability or death (five or more years of service), and
- (c) rates of retirement because of age.

In addition, certain new statistics had to be developed for purposes of calculations pertaining to co-ordination of benefits and contributions with the Canada Pension Plan. These are shown in Appendix 13.

In references to rates of termination, death and remarriage in the remainder of this report, the terms "select" and "ultimate" are used from time to time. In this connection,

- (a) "select" means rates classified by age at beginning of pensionable service for contributors employed in the Public Service, or by age at becoming entitled to an annuity or annual allowance for persons so entitled, and by number of complete years elapsed since that age, and
- (b) "ultimate" means rates classified by age only, derived from all the experience of the group being studied except that covering the years for which select rates have been determined.

2. Interest

As in preceding actuarial valuations, the rate of interest to be earned in the indefinite future was assumed to be four per cent per annum. Until the date of the current valuation, and indeed until the time of writing of this report, the rate of interest credited to the Account in accordance with Regulations was one per cent quarterly. It was therefore natural to assume that the Account would continue to earn a rate of four per cent in the future.

In the footnote on page 9 it was indicated that in the future interest might be credited to the Account at rates differing from the rate assumed in the preceding valuation. The exact method by which the total yearly interest credits to the Account will be determined in the future has not yet been decided by the Government. However, the Act now appears to place the responsibility on the actuary to select an assumed rate such that there would be a reasonable likelihood of the total interest credits in any one year exceeding the assumed rate, and that in the long run the credits in excess of the valuation rate in some years would offset deficiencies that might arise in other years.

While it does not seem likely that an assumed rate below four per cent per annum would suggest itself as necessary to meet the foregoing criteria, it also appears unlikely that a rate much in excess of four per cent would be selected as appropriate for future valuations.

In the current period of very high rates of interest many people find it difficult to accept an assumed interest rate at the level of four per cent as realistic. It therefore seems appropriate to make the following further observations in this connection.

One of the primary purposes of an actuarial valuation of a pension plan such as the Public Service Superannuation Plan is to establish the level of contributions required to provide all benefits for successive cohorts of new contributors. It is desirable that such contribution rates be applicable regardless of whether current interest rates are high or low, because it is not customary to set different rates for different generations of contributors. While in the long period of low interest rates from the 1930's to the 1950's, there was a natural tendency not to anticipate a return to high interest rates, there is a similar natural tendency at the present time not to anticipate a return to lower interest rates. In our estimation, the use of an assumed rate at the level of four per cent constitutes an attempt to make reasonable allowance for the long-term effect of interest earnings in the calculation of required rates of contributions.

Although it is generally desirable to select each of the actuarial assumptions on its own merits, in order to judge the reasonableness of the results, it is necessary to consider all the assumptions together. In judging the reasonableness of the interest assumption in valuations of pension plans such as the Public Service Superannuation plan where benefits are based on final-average salaries, it is particularly relevant to have regard to the assumptions used for purposes of estimating future salaries.

For reasons which will be noted in the discussion of salary scales, it was decided, for purposes of the current as well as preceding valuations, to include no provisions for increases in general levels of salaries. It seems consistent with this decision, to guard as much as possible against overly optimistic assumptions regarding future interest earnings, so that possible interest earnings in excess of the assumed rate might provide at least some offset to the substantial effect of general salary increases on pension costs. These considerations have persuaded us to retain the use of an assumed rate of interest of four per cent per annum for the valuation as at December 31, 1967.

3. Salary scales

The term "salary scale", as used in this report, denotes the assumed pattern of increase in salary from age to age over future years.

The manner in which salary will increase from age to age in the future must be predicted for valuation purposes, because both benefits and contributions depend on rates of salary that will be received in the future.

There are two main forces that tend to generate increases in the salary of an individual during his working lifetime. The first may be thought of as a "promotional" force. As an employee gains experience and attains new or higher skills in his work, he is normally rewarded by periodic increases in his salary. Such increases are hereinafter referred to as "promotional" increases. The second force is the resultant of the diverse forces that produce increases in the level of salaries generally or for certain classes of employees only - whether they occur as a direct result of collective bargaining or otherwise. Increases in salary resulting from this force are hereinafter referred to as "general" increases.

The pattern of average promotional increases in salary in most stable employment areas is fairly predictable on the basis of past experience. On the other hand, relatively little confidence can be placed in predictions of future increases in salary that depend on varying economic and social pressures. Even if salary scales were constructed to include provision for general salary increases on what might be considered a reasonable long term level, the use of such scales for valuation would only go a part of the way in solving the funding problem created by the very substantial rates of general salary increases that have taken place in recent years. Moreover, to the extent that the provision for general salary increases in basic contribution rates would constitute an attempt to preclude inflation, it may be expected to prove largely self-defeating, if practiced by large segments of society.

For these reasons, in the current and preceding examination of the operation of the Public Service Superannuation Account, the salary scales used for purposes of calculating the net liabilities in respect of current contributors and the required contribution rates in respect of new contributors have provided for promotional increases only.

This practice is reflected in the terms of the Public Service Superannuation Act which, as indicated earlier, provide that the Account shall be credited with an amount equal to the additional net liability created by a salary increase applicable to at least one per cent of the employed contributors. The implication in this provision is that the Government, as employer, has assumed responsibility for the additional net liabilities created under the plan as a result of general salary increases, and that such net liabilities will be provided for as and when they do materialize.

The valuation data included the rate of salary authorized to be paid to each contributor employed in the Public Service on December 31, 1967. These data were tabulated in such manner that the average increase in salary from age to age could be studied for all persons of the same age-group at beginning of pensionable service. Preliminary examination of these average increases pointed toward minor modification in the salary scales adopted for the 1957 and 1962 valuations. Further tests indicated that such modifications would have a negligible effect on the average required contribution rates, and that the salary scales used for the 1957 and 1962 valuations could reasonably be retained for the current valuation.

In Appendix 1 are shown the salary scales used for this valuation and, for specimen ages, the manner in which an initial salary of \$1,000 would increase in the future on the basis of these salary scales.

4. Rates of termination for all reasons (less than five years of pensionable service)

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

For the 1957 valuation, select rates of termination for all reasons were derived for each of the first five years varying by age from the experience of contributors over the 1948-57 period. These rates were also used for the 1962 valuation, and experience during the 1963-67 period indicated that these rates remain satisfactory in the case of females. On the other hand, the rates for males were somewhat modified to make allowance for the generally higher termination rates experienced in the 1963-67 period.

The rates used in this valuation are shown in Appendix 2.

5. Rates of termination for reasons other than age, disability or death (five or more years of pensionable service), and

Proportions of terminating contributors who elect to take a deferred annuity benefit

These rates and proportions pertain only to contributors who have not attained age 60.

The rates of termination used for purposes of the 1957 and 1962 valuations were developed from the experience among contributors during the period from 1948 to 1957. For the current valuation slightly higher rates were adopted to give some recognition to the general level of the rates that were experienced from 1958 to 1967. They are shown in Appendix 3.

As described in the "Summary of Benefits", contributors who terminate service for reasons other than age, disability or death and have five or more years of pensionable service, have the option* of electing a return of contributions, a deferred annuity to commence at age 60, or an annual allowance to commence immediately if the contributor's age is 50 or over, or at age 50 if the contributor's age is under 50.

The value of a deferred annuity benefit is considerably greater than the value of a return of contributions benefit. For valuation purposes, therefore, it is necessary to determine the proportion of contributors who, on terminating service, elect to take a deferred annuity benefit (including those who elect to take an annual allowance which is calculated in such manner that its value, in accordance with certain mortality and interest assumptions, is equal to the value of the deferred annuity).

For the 1957 valuation, proportions of contributors who elect to take a deferred annuity were developed from the experience of the 1948-57 period. In the previous actuarial report it was noted that, despite increasing publicity given to portability of pensions, the 1958-62 experience revealed no trend toward an increase in the proportion of contributors electing to take a deferred annuity and that in fact actual proportions were slightly less than expected. The 1963-67 experience did indicate a slightly increased awareness of the value of deferred annuities among contributors at age 50 and over. However, no change was considered necessary in the proportions used for purposes of valuation. They are shown in Appendix 3.

* See Notes 7 and 8 on pages 6 and 7.

6. Rates of retirement because of age

The provision of continuing income after completion of an employee's normal working lifetime is the primary purpose of most pension plans. Under the Public Service Superannuation plan, a contributor becomes entitled to an immediate annuity upon retirement at age 60 or over, provided that such contributor has at least five years of pensionable service. In this report, such retirements are termed "retirements because of age".

The rates of retirement because of age used in the 1957 and 1962 valuations were developed from the experience of the 1948-57 period. In contrast to the 1958-62 experience, the 1963-67 period exhibited a marked trend toward somewhat heavier rates of retirement both before and after attainment of age 65. In order to make some allowance for what appeared to be a rather significant change, new rates were constructed for the current valuation. They are shown in Appendix 4.

As might be expected, the age-retirement rates do not increase smoothly from age to age. Instead, there is a slight heaping at age 60, that is, the earliest age at which a full immediate annuity benefit is available, and a sharp increase at age 65, the age that may be regarded as the "normal retirement age" and after which employment in the Public Service is contingent on special authorization from year to year.

As for previous experience periods, the data for the 1963-67 period showed that a negligible number of contributors remain employed in the Public Service beyond age 70. Thus, the assumption that all active contributors who attain age 70 cease to be employed during the following year was retained for valuation purposes.

7. Rates of retirement because of disability

Under the Superannuation plan, a contributor becomes entitled to an immediate annuity or other optional* benefits in the event of disability, provided that such contributor has at least five years of pensionable service.

The rates of retirement because of disability that were used in the 1957 and 1962 valuations were developed from the experience of the 1948-57 period. These rates, shown in Appendix 5, were also used for the current valuation.

It may be mentioned that the rates developed for use in the 1957 valuation and retained for use in the current valuation were substantially lower than those developed from experience prior to 1948 and used in the 1947 valuation. It was, therefore, a matter of no little interest to find that the number of retirements because of disability during both the 1958-62 and the 1963-67 periods were less than might have been expected even on the basis of the rather low rates of disability developed from the experience of the 1948-57 period; however, the margin for the 1963-67 period was rather small compared to that of the 1958-62 period.

* See Note 8 on page 7.

8. Rates of mortality and remarriage

For valuation purposes, mortality rates expected to be experienced in the future are required for each of the following groups:

- (a) contributors employed in the Public Service with five or more years of pensionable service, males and females separately;
- (b) contributors entitled to an annuity or annual allowance for reasons other than disability, males and females separately;
- (c) contributors entitled to an annuity because of disability, males and females separately;
- (d) widows of deceased contributors;
- (e) children of deceased contributors.

Since widows' allowances are suspended on remarriage, rates of remarriage are needed for their valuation.

The bases used for the current valuation are described in the following paragraphs:

- (a) Contributors employed in the Public Service with five or more years of pensionable service

The mortality rates used for purposes of the 1957 and 1962 valuations were selected so as to provide a small margin beyond the rates experienced to provide for expected improvement in mortality. In the case of males, the rates were those of the α -1949 Table* projected 10 years in accordance with Projection Scale B**. In the case of females, the rates were derived from the 1948-57 experience of full-time female contributors. The experience of the 1962-67 period indicated that these rates continue to provide a small margin and, accordingly, they were deemed appropriate for use in the current valuation. They are shown in Appendix 6.

- (b) Contributors entitled to an annuity or annual allowance for reasons other than disability

For purposes of the 1962 valuation, the mortality rates deemed suitable to provide a margin for improvement in mortality over a considerable future period were, for males, the α -1949 Table and, for females, the α -1949 Table projected in accordance with Projection Scale C**, assuming year of birth 1910.

The experience of the 1962-67 period indicated that these rates continue to be satisfactory and, accordingly, they were retained for the current valuation.

The rates used for both males and females and the relevant annuity values are shown in Appendix 7.

* Transactions of the Society of Actuaries, Vol. I, pp. 386-9.

** Transactions of the Society of Actuaries, Vol. IV, p. 272.

(c) Contributors entitled to an annuity because of disability

The rates used in the 1957 and 1962 valuations were select and ultimate rates of mortality developed from the experience of the 1948-57 period. The 1963-67 experience indicated that these rates continue to provide a reasonable margin for the secular trend toward lower mortality which may also be expected to affect disabled lives. Accordingly, these rates were retained for use in the current valuation.

The ultimate rates of mortality, applicable after the first three years following retirement, are shown in Appendices 8 and 9 for males and females, respectively. Rates of mortality for the first, second and third years following retirement are assumed to be the following multiples of the ultimate rates:

- (i) for males, 250%, 175% and 125%, respectively, and
- (ii) for females, 190%, 145% and 115%, respectively.

The above multiples, which were determined on the basis of the 1948-57 experience, were considered to be appropriate for the current valuation although both the 1963-67 and 1958-62 experience indicated a somewhat higher mortality in these early years.

Also shown in Appendix 8, for males, and in Appendix 9, for females, are annuity values based on the select and ultimate rates and on the ultimate rates only.

(d) Widows

The rates of mortality used for purposes of the 1957 and 1962 valuations were derived from the 1948-57 experience of widows under the Superannuation plan, and were designed to provide some margin for future improvement in mortality. The 1963-67 experience rates were somewhat higher than the 1958-62 experience rates, and it was considered satisfactory to retain the basis for the current valuation, particularly in view of the margin that appears to subsist in the rates of remarriage.

The rates of remarriage, varying by age and duration from widowhood, that were used for purposes of the 1957 and 1962 valuations were developed from the experience during the period from January 1, 1940, to December 31, 1957, of widows awarded pensions from August 4, 1914, to December 31, 1957, under the Pension Act and previous Government administrative orders.

Experience among widows of contributors under the Superannuation plan, for the 1948-57 and later periods, indicated that remarriage is somewhat more likely for such widows than for widows awarded pensions under the Pension Act. However, it was considered that a moderate margin in the remarriage rates constituted a desirable offset to the vanishing margin in the mortality rates and, accordingly, the remarriage basis was retained for the current valuation.

In Appendix 10 are shown

- (i) select remarriage rates for quinquennial ages at widowhood 25 to 55 and specimen durations from widowhood,
- (ii) ultimate remarriage rates and aggregate mortality rates for quinquennial ages commencing at age 39, and
- (iii) annuity values based on the probabilities of payments ceasing as a result of death or remarriage for the ages and durations noted in (i) and (ii).

(e) Children

In the current as well as preceding valuations, mortality was ignored in determining the value of allowances payable to children, because such allowances were not payable beyond age 18, and the effect of mortality at the relevant ages would have been negligible.

As noted on page 2, the 1969 amendments extended children's allowances to age 25, under certain conditions. This new provision, of course, was not taken into account in the valuation as at December 31, 1967. In any event, it is not likely that the element of mortality will be introduced as a separate contingency into future valuations, because above age 18, allowances may be terminated by reason of marriage or non-attendance of school - factors which will outweigh mortality by far.

9. Proportions of male contributors married at death, and

Average ages of widows corresponding to ages of contributors at death

These proportions and average ages are needed to value prospective benefits of future widows of contributors who at the time of their death are either employed in the Public Service or are entitled to an annuity or annual allowance.

Proportions of male contributors married at death were derived for purposes of the 1957 valuation from the 1948-57 experience for employed and retired contributor groups, separately. During the 1958-67 period, the proportion married at death among both employed and retired contributors was somewhat higher than that expected in accordance with the 1957 basis.

Average ages of widows corresponding to ages of contributors at death were derived for purposes of the 1957 valuation from the 1948-57 experience for employed and retired contributors combined. During the 1958-67 period, the average ages of widows who became entitled to an annual allowance were slightly higher than expected in accordance with the 1957 basis.

Because of the offsetting effects of indicated trends in the two factors under consideration, it was considered appropriate to continue the use of the 1957 bases for the current valuation. Values are shown in Appendix 11 for quinquennial ages of contributors at death.

10. Children's benefits

For each age at death of contributors, there is needed the average value of children's benefits per \$1.00 of the annuity payable to a contributor or that would have been payable to a contributor if he had retired on immediate annuity at the date of his death. Such values were derived from the 1948-57 experience data for purposes of the 1957 valuation. These values were considered to remain appropriate for purposes of the current valuation. Sample values are shown in Appendix 11.

11. Capitalized values of annuity or annual allowance benefits

In Appendix 12 are shown, for quinquennial ages, the values of annuities or annual allowances emerging in the event of certain contingencies. For retirements below age 60 for reasons other than disability, the values shown are in respect of a deferred annuity benefit to commence at age 60. For all male retirements, the values include provision for prospective allowances to widows and children. All values include provision for payment of an aggregate amount of benefit at least equal to the contributor's total contributions without interest.

IV. REQUIRED RATES OF CONTRIBUTION

Using the assumptions described in the preceding section of this report, and the distribution of new contributors who entered in the five years ending December 31, 1967 (shown in Appendix 14), the total rates required from contributors and the Government combined to provide all benefits were calculated to be as follows:

Males: 13.5% of salary, less Canada Pension Plan contributions

Females: 11.6% of salary, less Canada Pension Plan contributions

The rates quoted in the preceding actuarial report were 12.9% of salary for males and 11.6% for females. It had been estimated that the Canada Pension Plan co-ordination formula was such as to leave the total contribution requirements to both plans essentially unchanged. However, an increase of the order of one-half of one per cent was expected as a result of the provision for mandatory deferred annuity after age forty-five and completion of ten years of service.

The difference between the two sets of rates is accounted for approximately as follows:

	<u>Effect on combined P.S.S.A. - C.P.P. contribution rate</u>	
	<u>Males</u>	<u>Females</u>
(a) Provision for mandatory deferred annuities	+0.5%	+0.5%
(b) Co-ordination with Canada Pension Plan	+0.1	-0.7
(c) Change in valuation assumptions	+0.2	+0.2
(d) Change in age distribution of new contributors	-0.2	-
Total change	<u>+0.6%</u>	<u>-</u>

As noted on page 8, contributions paid by contributors to the Account are $6\frac{1}{2}\%$ for males and 5% for females, less amounts approximately equal to contributions required by the Canada Pension Plan. It is clear that these contributions together with matching Government credits to the

Account still leave a shortage of 0.5% of salary in respect of males and 1.6% of salary in respect of females. If no changes are made in the present rates of contributions and Government credits, a deficit of the order of forty-five million dollars may be expected to accumulate by December 31, 1972, in respect of persons who become contributors between December 31, 1967 and December 31, 1972.

If it were desired to raise Government credits to the Account to a level which would avoid the accumulation of deficits in respect of new contributors, it is estimated that such credits should be made at the rate of 7/6 times the amount of employee contributions rather than on a simple matching basis.

As in the preceding examination, a special study was made to determine what the effect on basic rates of contributions would be, if some provision for general salary increases were to be incorporated in such rates. Accordingly, it was calculated that in order to provide for future general salary increases at the rate of three per cent per annum in addition to normal promotional increases, the rates required from contributors and the Government combined would be higher by about 5.1% of salary for males and 3.6% for females. It is significant to note that the equivalent uniform annual rate at which average salaries of contributors increased between December 31, 1962 and December 31, 1967, was more than $5\frac{3}{4}\%$ for males, about $4\frac{3}{4}\%$ for females and more than $5\frac{1}{2}\%$ for males and females combined.

In order to obtain some measure of the effect of possible interest credits in excess of 4%, it was further estimated that, if all funds in the Account were to be credited with, say, interest at a rate of $5\frac{1}{2}\%$ prior to the commencement of annuities or allowances and 4% thereafter, the basic contributions and credits at the rates quoted in the first paragraph of this section would support future general salary increases of not more than 2% per annum.

V. VALUATION BALANCE SHEET AND OBSERVATIONS

The results of the valuation are summarized and the financial status of the Account as at December 31, 1967, is shown in the Balance Sheet below. In the construction of this balance sheet it was assumed that current service contributions of contributors would continue at the rate of $6\frac{1}{2}\%$ of salary for males and the rate of 5% of salary for females, less Canada Pension Plan contributions, and that credits to the Account on behalf of the Government would equal the total contributions by contributors on a continuing basis. The salary scales used in the valuation make no provision for future general salary increases. Thus, the balance sheet reflects the provision in the Act under which, in the event of general salary increases, credits equal to the net liabilities created thereby are made to the Account on behalf of the Government at the time such increases are authorized.

In the foregoing balance sheet it is shown that an estimated net actuarial deficit of about \$47 million accumulated in the five years following December 31, 1962. The more noteworthy elements having a bearing on the development of this deficit are described in the following numbered paragraphs.

1. As noted in Section I of this report, both benefits and contributions in respect of service after 1965 were adjusted for purposes of co-ordination with the Canada Pension Plan. It is estimated that the effect of this amendment was a decrease in the net liabilities of the Account of about \$93 million.

2. It was also noted in Section I, that the terms of the Superannuation plan were amended to provide for mandatory deferred annuities after ten years of service and attainment of age forty-five. This amendment was estimated to have resulted in an increase in the liabilities of about \$57 million.

3. In Section IV of this report it was indicated that there appeared to be shortages in the combined rates of contributions and Government credits of about 0.5% of salaries in respect of males and 1.6% of salaries in respect of females. It is estimated that the additional actuarial liability created by these deficiencies in respect of persons who became contributors in the five years following December 31, 1962, was about \$42 million.

4. As noted in Section III of this report, the experience that developed after December 31, 1962, indicated changes in certain assumptions for purposes of the current valuation. The effect of these changes was an increase in net liabilities of the Account of about \$29 million.

5. The net effect of the items discussed in the foregoing four paragraphs would be a deficit of thirty-five million dollars or about twelve million dollars less than indicated in the balance sheet. The difference is attributable to the net effect of a number of largely offsetting factors, such as various differences between actual and expected experience and in statistics between the current and preceding valuations.

It should be noted that the balance sheet deficit of \$47.332 million is based on the assumption that the combined rates of contributions from contributors and Government credits will continue unchanged in the future. However, it was indicated in Section V of this report that, if it were desired to avoid future deficits resulting from estimated shortages in these rates, Government credits might be raised to 7/6 times the amount of contributions received from contributors. If this had been done effective December 31, 1967, the present value of future credits by the Government would have been increased by about \$111 million, which evidently would have more than offset the reported deficit of \$47.332 million.

VI CONCLUSIONS

1. The average rates of contribution estimated to be required to provide for benefits in respect of new contributors, for contributors and Government combined, are 13.5% and 11.6% of salaries less Canada Pension Plan contributions in respect of males and females, respectively. These rates make no provision for possible future increases in the general level of salaries; it is assumed that the net liabilities arising from such increases will be provided for by the Government as and when they occur.

2. On the assumption that the combined rates of contributions and Government credits to the Account presently being made remain unchanged, the estimated deficit in the Account as at December 31, 1967, was \$47.332 million. Moreover, if these combined rates do remain unchanged, a deficit

of the order of \$45 million may be expected to accumulate in respect of persons who become contributors between December 31, 1967, and December 31, 1972.

3. If it were desired to raise Government credits to the Account to a level which would avoid the accumulation of deficits in respect of new contributors, it is estimated that this might be accomplished by making Government credits at the rate of 7/6 times the amount of contributions received from contributors.

In closing, it is a pleasure to acknowledge the co-operation and able assistance of the Superannuation Branch and the General Analysis and Programming Division of the Department of Supply and Services.

Respectfully submitted,



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November 5, 1969.

VII. A P P E N D I C E S

- 1 Salary Scales and Illustration of increases in salary in accordance with salary scales
- 2 Select Rates of Termination for all reasons (less than five years of pensionable service)
- 3 Rates of Termination for reasons other than age, disability or death (five or more years of pensionable service), and Proportions of Contributors Electing to Take a Deferred Annuity
- 4 Rates of Retirement because of Age (five or more years of pensionable service)
- 5 Rates of Retirement because of Disability (five or more years of pensionable service)
- 6 Rates of Mortality for employed contributors (five or more years of pensionable service)
- 7 Rates of Mortality for contributors retired for reasons other than disability and Annuity Values based thereon
- 8 Rates of Mortality for male contributors retired because of disability and Annuity Values based thereon
- 9 Rates of Mortality for female contributors retired because of disability and Annuity Values based thereon
- 10 Rates of Remarriage and Mortality for widows and Annuity Values based thereon
- 11 Proportions of Male Contributors Married at Death, Average Ages of Widows corresponding to ages of contributors at death, and Values of Children's Benefits per \$1.00 "earned" annuity per contributor at death
- 12 Capitalized Values of Annuity or Annual Allowance Benefits per \$1.00 "earned" annuity of contributors at retirement or death
- 13 Proportion of contributors with salaries below "Year's Maximum Pensionable Earnings" (as defined in Canada Pension Plan), and Ratios of average salary to "Year's Maximum Pensionable Earnings" for contributors with salaries below that maximum
- 14 Age Distribution of employees who became contributors during the period from January 1, 1963, to December 31, 1967

A P P E N D I X 1

<u>Salary Scales</u>			<u>Illustration of increases in salary in accordance with salary scales</u>			
<u>Age</u>	<u>Males</u>	<u>Females</u>	<u>Age</u>	<u>Males</u>		
18	0.385	0.396	20	\$1,000		
19	0.401	0.412				
20	0.418	0.429	25	1,237		
21	0.436	0.447				
22	0.455	0.466				
23	0.475	0.486	30	1,500	\$1,000	
24	0.496	0.507				
25	0.517	0.529	35	1,749	1,166	
26	0.539	0.551				
27	0.561	0.573				
28	0.583	0.596	40	1,962	1,308	\$1,000
29	0.605	0.619				
30	0.627	0.642	45	2,122	1,415	1,082
31	0.649	0.664				
32	0.670	0.686				
33	0.691	0.707	50	2,234	1,490	1,139
34	0.711	0.728				
35	0.731	0.748	55	2,309	1,539	1,177
36	0.750	0.767				
37	0.769	0.785				
38	0.787	0.802	60	2,352	1,568	1,199
39	0.804	0.819				
40	0.820	0.834	65	2,378	1,585	1,212
41	0.836	0.849				
42	0.850	0.863				
43	0.863	0.876				
44	0.876	0.888				
45	0.887	0.899				
46	0.898	0.910	20	1,000		
47	0.908	0.919				
48	0.917	0.928	25	1,233		
49	0.926	0.936				
50	0.934	0.943	30	1,497	1,000	
51	0.941	0.950				
52	0.948	0.956				
53	0.954	0.962	35	1,744	1,165	
54	0.960	0.967				
55	0.965	0.971	40	1,944	1,299	1,000
56	0.969	0.975				
57	0.973	0.979				
58	0.977	0.982	45	2,096	1,400	1,078
59	0.980	0.985				
60	0.983	0.988	50	2,198	1,469	1,131
61	0.986	0.990				
62	0.988	0.992				
63	0.990	0.994	55	2,263	1,512	1,164
64	0.992	0.995				
65	0.994	0.996	60	2,303	1,539	1,185
66	0.995	0.997				
67	0.997	0.998				
68	0.998	0.998	65	2,322	1,551	1,194
69	0.999	0.999				
70	1.000	1.000				

Females

A P P E N D I X 2

Select Rates of Termination for all reasons

Age at beg. of Pens. Svc.	<u>Males</u>					<u>Females</u>				
	<u>Completed Years of Pensionable Service</u>					<u>Completed Years of Pensionable Service</u>				
	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
18	.3068	.2331	.1710	.1331	.0890	.2563	.2703	.2318	.2313	.2040
19	.2847	.2140	.1484	.1208	.0816	.2769	.2999	.2480	.2424	.2142
20	.2626	.1974	.1320	.1109	.0759	.2990	.3266	.2665	.2496	.2201
21	.2416	.1824	.1216	.1028	.0713	.3199	.3445	.2840	.2492	.2193
22	.2232	.1688	.1144	.0959	.0677	.3372	.3505	.2901	.2469	.2120
23	.2082	.1568	.1088	.0901	.0648	.3490	.3479	.2871	.2395	.2015
24	.1982	.1469	.1042	.0851	.0624	.3525	.3417	.2794	.2308	.1891
25	.1908	.1392	.1000	.0809	.0604	.3484	.3331	.2691	.2202	.1765
26	.1852	.1324	.0961	.0773	.0586	.3421	.3214	.2572	.2079	.1641
27	.1808	.1270	.0924	.0742	.0570	.3352	.3090	.2455	.1961	.1520
28	.1772	.1220	.0890	.0716	.0556	.3281	.2970	.2330	.1844	.1401
29	.1744	.1177	.0858	.0692	.0543	.3206	.2852	.2202	.1729	.1289
30	.1720	.1140	.0829	.0672	.0532	.3125	.2734	.2077	.1620	.1186
31	.1701	.1106	.0802	.0654	.0521	.3034	.2620	.1951	.1519	.1089
32	.1683	.1076	.0777	.0638	.0512	.2933	.2508	.1822	.1422	.1000
33	.1668	.1051	.0756	.0624	.0505	.2822	.2397	.1697	.1331	.0920
34	.1655	.1028	.0738	.0610	.0498	.2698	.2286	.1574	.1249	.0850
35	.1643	.1008	.0722	.0598	.0493	.2571	.2181	.1466	.1178	.0790
36	.1632	.0992	.0708	.0588	.0490	.2441	.2075	.1375	.1115	.0741
37	.1621	.0978	.0696	.0579	.0487	.2321	.1972	.1300	.1061	.0699
38	.1610	.0967	.0687	.0571	.0485	.2212	.1871	.1241	.1017	.0666
39	.1600	.0956	.0679	.0565	.0484	.2120	.1771	.1195	.0980	.0636
40	.1589	.0948	.0672	.0561	.0483	.2043	.1676	.1159	.0949	.0614
41	.1578	.0942	.0668	.0558	.0483	.1977	.1579	.1130	.0924	.0596
42	.1568	.0937	.0665	.0557	.0484	.1925	.1494	.1107	.0903	.0583
43	.1559	.0933	.0663	.0558	.0485	.1882	.1423	.1089	.0889	.0574
44	.1550	.0931	.0662	.0559	.0487	.1848	.1364	.1074	.0877	.0568
45	.1541	.0930	.0663	.0563	.0490	.1822	.1317	.1064	.0869	.0566
46	.1534	.0930	.0664	.0568	.0495	.1800	.1280	.1056	.0864	.0567
47	.1527	.0932	.0667	.0574	.0501	.1785	.1253	.1050	.0861	.0572
48	.1521	.0935	.0672	.0584	.0511	.1774	.1233	.1046	.0859	.0581
49	.1517	.0940	.0678	.0596	.0523	.1765	.1219	.1046	.0860	.0593
50	.1513	.0948	.0688	.0611	.0538	.1759	.1211	.1047	.0864	.0611
51	.1512	.0959	.0700	.0628	.0559	.1754	.1208	.1052	.0871	.0633
52	.1512	.0972	.0717	.0650	.0585	.1750	.1208	.1059	.0881	.0661
53	.1513	.0990	.0738	.0675	.0619	.1748	.1213	.1069	.0896	.0694
54	.1518	.1012	.0765	.0706	.0663	.1748	.1222	.1082	.0917	.0737
55	.1525	.1040	.0799	.0742	.0719	.1749	.1234	.1100	.0942	.0790

A P P E N D I X 3

Rates of Termination for reasons other than age, disability or death (five or more years of pensionable service)*

and

Proportions of Contributors Electing to Take a Deferred Annuity**

<u>Age</u>	<u>Males</u>		<u>Females</u>	
	<u>Rate of Termination*</u>	<u>Proportion Electing Deferred Annuity</u>	<u>Rate of Termination*</u>	<u>Proportion Electing Deferred Annuity</u>
20	.0655	.044	.1090	.009
21	.0609	.049	.1206	.012
22	.0567	.055	.1342	.014
23	.0528	.061	.1495	.018
24	.0493	.066	.1620	.022
25	.0461	.072	.1616	.026
26	.0431	.078	.1524	.031
27	.0404	.084	.1411	.037
28	.0380	.090	.1278	.043
29	.0356	.096	.1119	.050
30	.0335	.102	.0970	.058
31	.0316	.109	.0857	.067
32	.0298	.115	.0773	.077
33	.0281	.121	.0701	.087
34	.0265	.128	.0638	.099
35	.0250	.135	.0580	.111
36	.0236	.141	.0528	.124
37	.0223	.148	.0482	.137
38	.0210	.155	.0439	.152
39	.0198	.162	.0400	.167
40	.0186	.170	.0367	.183
41	.0176	.177	.0336	.200
42	.0166	.185	.0310	.218
43	.0157	.192	.0287	.236
44	.0148	.200	.0265	.254
45	.0141	.209	.0247	.274
46	.0134	.217	.0229	.294
47	.0128	.225	.0215	.314
48	.0123	.234	.0202	.335
49	.0118	.243	.0191	.357
50	.0113	.252	.0182	.379
51	.0108	.260	.0173	.401
52	.0104	.270	.0167	.424
53	.0101	.279	.0161	.447
54	.0098	.288	.0156	.470
55	.0095	.297	.0152	.493
56	.0092	.307	.0149	.517
57	.0090	.316	.0146	.541
58	.0088	.326	.0144	.565
59	.0086	.336	.0143	.588

* See Note 2 on page 5.

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

A P P E N D I X 4

Rates of Retirement because of age*

<u>Age</u>	<u>Males</u>	<u>Females</u>
60	0.0870	0.0990
61	0.0692	0.0818
62	0.0662	0.0789
63	0.0762	0.0863
64	0.0965	0.1118
65	0.6170	0.6060
66	0.5120	0.4860
67	0.4350	0.3740
68	0.3810	0.3340
69	0.4320	0.3830
70	1.0000	1.0000

* See Note 2 on page 5.

A P P E N D I X 5

Rates of Retirement because of disability*

<u>Age</u>	<u>Males</u>	<u>Females</u>
20	.0002	.0011
21	.0002	.0011
22	.0002	.0011
23	.0002	.0011
24	.0002	.0012
25	.0002	.0012
26	.0003	.0012
27	.0003	.0012
28	.0003	.0012
29	.0003	.0012
30	.0004	.0012
31	.0004	.0013
32	.0004	.0013
33	.0004	.0013
34	.0005	.0013
35	.0005	.0014
36	.0006	.0014
37	.0006	.0015
38	.0007	.0015
39	.0008	.0016
40	.0009	.0017
41	.0010	.0018
42	.0011	.0020
43	.0013	.0022
44	.0015	.0024
45	.0017	.0027
46	.0020	.0031
47	.0024	.0036
48	.0029	.0041
49	.0035	.0047
50	.0042	.0054
51	.0050	.0062
52	.0059	.0072
53	.0070	.0085
54	.0082	.0100
55	.0095	.0118
56	.0109	.0139
57	.0124	.0162
58	.0140	.0187
59	.0157	.0214

* See Note 2 on page 5.

A P P E N D I X 6

Rates of Mortality for employed contributors

<u>Age</u>	<u>Males</u>	<u>Females</u>
20	.0006	.0006
21	.0006	.0006
22	.0006	.0006
23	.0006	.0006
24	.0006	.0006
25	.0007	.0006
26	.0007	.0006
27	.0007	.0007
28	.0008	.0007
29	.0008	.0007
30	.0009	.0007
31	.0009	.0007
32	.0010	.0007
33	.0011	.0008
34	.0011	.0008
35	.0012	.0008
36	.0013	.0008
37	.0014	.0008
38	.0015	.0009
39	.0017	.0009
40	.0018	.0010
41	.0020	.0010
42	.0022	.0011
43	.0025	.0011
44	.0028	.0012
45	.0032	.0013
46	.0036	.0014
47	.0041	.0015
48	.0046	.0016
49	.0052	.0018
50	.0058	.0019
51	.0064	.0021
52	.0071	.0023
53	.0078	.0025
54	.0085	.0028
55	.0093	.0030
56	.0101	.0033
57	.0110	.0037
58	.0119	.0040
59	.0128	.0044
60	.0138	.0049
61	.0149	.0054
62	.0161	.0060
63	.0175	.0067
64	.0190	.0075
65	.0206	.0084
66	.0225	.0094
67	.0245	.0106
68	.0268	.0120
69	.0292	.0137
70	.0320	.0157

A P P E N D I X 7

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

<u>Age</u>	<u>Rate of Mortality</u>		<u>Value of Annuity of \$1.00 per annuum to commence at age 60 or immediately if age is 60 or over (interest at 4% per annum)</u>	
	<u>Males</u>	<u>Females</u>	<u>Males</u>	<u>Females</u>
50	.0066	.0027	\$ 6.923	\$ 9.668
51	.0073	.0029	7.272	10.082
52	.0080	.0031	7.650	10.516
53	.0088	.0034	8.061	10.971
54	.0097	.0036	8.509	11.448
55	.0106	.0039	8.999	11.949
56	.0115	.0042	9.537	12.476
57	.0125	.0046	10.129	13.030
58	.0135	.0049	10.785	13.613
59	.0145	.0054	11.515	14.228
60	.0157	.0058	12.331	14.877
61	.0169	.0064	11.999	14.540
62	.0182	.0069	11.665	14.195
63	.0197	.0076	11.326	13.842
64	.0213	.0083	10.985	13.481
65	.0231	.0091	10.642	13.113
66	.0250	.0099	10.297	12.738
67	.0272	.0109	9.950	12.355
68	.0296	.0119	9.603	11.965
69	.0322	.0131	9.256	11.567
70	.0351	.0144	8.909	11.162
71	.0383	.0160	8.563	10.751
72	.0418	.0179	8.219	10.334
73	.0456	.0201	7.878	9.915
74	.0499	.0225	7.540	9.492
75	.0545	.0252	7.206	9.066
76	.0596	.0285	6.876	8.639
77	.0652	.0322	6.551	8.213
78	.0714	.0365	6.232	7.788
79	.0781	.0414	5.920	7.367
80	.0855	.0470	5.614	6.950
81	.0936	.0534	5.316	6.539
82	.1024	.0608	5.026	6.135
83	.1121	.0693	4.744	5.740
84	.1227	.0790	4.471	5.355
85	.1342	.0901	4.208	4.982
86	.1467	.1030	3.954	4.623
87	.1603	.1177	3.709	4.280
88	.1751	.1345	3.475	3.955
89	.1912	.1539	3.251	3.652
90	.2085	.1762	3.037	3.375

A P P E N D I X 8

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

Age	Ultimate Rate (applicable after at least 3 yrs. have elapsed from date of retirement)	Value of Annuity of \$1.00 per annum (interest at 4% per annum)	
		At date of retirement	Applicable after at least 3 yrs. have elapsed from date of retirement
25	.0072	\$18.232	\$18.550
26	.0073	18.093	18.408
27	.0074	17.945	18.261
28	.0075	17.791	18.110
29	.0076	17.630	17.952
30	.0077	17.462	17.789
31	.0078	17.291	17.621
32	.0080	17.113	17.445
33	.0082	16.929	17.265
34	.0084	16.740	17.080
35	.0086	16.543	16.889
36	.0088	16.340	16.693
37	.0090	16.132	16.490
38	.0093	15.918	16.281
39	.0096	15.700	16.066
40	.0100	15.467	15.845
41	.0103	15.232	15.620
42	.0107	14.990	15.389
43	.0111	14.743	15.152
44	.0116	14.494	14.909
45	.0122	14.232	14.661
46	.0128	13.976	14.410
47	.0135	13.712	14.154
48	.0142	13.441	13.894
49	.0150	13.160	13.630
50	.0158	12.858	13.364
51	.0167	12.530	13.093
52	.0177	12.184	12.819
53	.0188	11.868	12.543
54	.0200	11.600	12.264
55	.0212	11.379	11.985
56	.0225	11.190	11.703
57	.0240	11.028	11.419
58	.0256	10.883	11.135
59	.0273	10.750	10.851
60	.0292		10.567
65	.0400		9.167
70	.0549		7.798
75	.0751		6.479
80	.1044		5.234
85	.1464		4.092
90	.2085		3.037

A P P E N D I X 9

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

Age	Ultimate Rate (applicable after at least 3 yrs. have elapsed from date of retirement)	Value of Annuity of \$1.00 per annum (interest at 4% per annum)	
		At date of retirement	Applicable after at least 3 yrs. have elapsed from date of retirement
25	.0069	\$19.275	\$19.469
26	.0070	19.171	19.365
27	.0071	19.062	19.257
28	.0072	18.950	19.147
29	.0073	18.834	19.034
30	.0074	18.716	18.917
31	.0075	18.595	18.796
32	.0076	18.469	18.672
33	.0077	18.340	18.544
34	.0078	18.209	18.411
35	.0079	18.067	18.274
36	.0080	17.920	18.132
37	.0081	17.770	17.985
38	.0082	17.619	17.833
39	.0084	17.461	17.675
40	.0086	17.297	17.514
41	.0088	17.133	17.348
42	.0090	16.960	17.177
43	.0092	16.782	17.002
44	.0094	16.597	16.821
45	.0096	16.405	16.635
46	.0098	16.214	16.443
47	.0100	16.013	16.245
48	.0103	15.808	16.040
49	.0106	15.593	15.830
50	.0109	15.369	15.614
51	.0112	15.132	15.392
52	.0116	14.892	15.163
53	.0120	14.645	14.928
54	.0124	14.408	14.688
55	.0128	14.175	14.441
56	.0133	13.952	14.186
57	.0138	13.736	13.926
58	.0144	13.532	13.658
59	.0150	13.333	13.384
60	.0157		13.104
65	.0203		11.610
70	.0277		9.978
75	.0401		8.242
80	.0620		6.468
85	.1048		4.789
90	.1762		3.375

A P P E N D I X 10

Rates of Remarriage and Mortality for widows

<u>Age at Widowhood</u>	<u>Rate of Remarriage</u>					<u>Attained Age</u>	<u>Rate of Mortality</u>
	<u>Year of Widowhood</u>						
	<u>1st yr.</u>	<u>3rd yr.</u>	<u>5th yr.</u>	<u>10th yr.</u>	<u>Ultimate</u>		
25	.050	.148	.132	.060	.028	39	.0022
30	.029	.086	.076	.035	.016	44	.0026
35	.018	.048	.042	.019	.009	49	.0033
40	.011	.027	.023	.010	.004	54	.0050
45	.006	.015	.012	.005	.002	59	.0083
50	.004	.008	.006	.002	.001	64	.0141
55	.002	.004	.003	.001	0	69	.0232
						74	.0367
						79	.0559
						84	.0822
						89	.1180

Value of Annuity of \$1.00 per annum payable
to death or remarriage of widow
(interest at 4% per annum)

<u>Age at Widowhood</u>	<u>Year of Widowhood</u>					<u>Attained Age</u>
	<u>1st yr.</u>	<u>3rd yr.</u>	<u>5th yr.</u>	<u>10th yr.</u>	<u>Ultimate</u>	
25	\$ 8.393	\$ 8.687	\$10.453	\$14.731	\$16.465	39
30	11.992	12.306	13.644	16.232	16.854	44
35	14.821	14.954	15.692	16.759	16.423	49
40	16.326	16.249	16.494	16.407	15.429	54
45	16.717	16.421	16.279	15.414	14.013	59
50	16.209	15.757	15.349	14.013	12.386	64
55	15.142	14.553	13.977	12.386	10.681	69
					9.008	74
					7.447	79
					6.040	84
					4.789	89

A P P E N D I X 11

Proportions of Male Contributors Married at Death;
Average Ages of Widows corresponding to ages of
contributors at death;

and

Values of Children's Benefits per \$1.00 "earned"
annuity per contributor at death

<u>Age of Contributor at Death</u>	<u>Proportion of Male Contributors Married at Death</u>		<u>Average Age of Widows</u>	<u>Value of Children's Benefits</u>	
	<u>Employed Contributors</u>	<u>Retired Contributors</u>		<u>Employed Contributors</u>	<u>Retired Contributors</u>
25	.811	.315	24.36	\$1.624	\$0.576
30	.826	.455	29.01	1.679	.832
35	.844	.575	33.61	1.628	.991
40	.864	.673	38.16	1.417	.977
45	.885	.749	42.68	1.025	.763
50	.901	.802	47.20	.618	.476
55	.909	.828	51.68	.316	.243
60	.898	.826	56.14	.139	.106
65	.867	.797	60.57	.051	.039
70	.832	.737	64.94	.016	.011
75		.646	69.19		.003
80		.526	73.20		
85		.392	76.57		
90		.263	78.58		

A P P E N D I X 12

Capitalized Values of Annuity or Annual Allowance Benefits
per \$1.00 "earned" annuity of contributors at retirement or death
(interest at 4% per annum)

<u>Age of Contributor at Retirement</u>	<u>On Retirement for reasons other than disability</u>		<u>On Retirement because of age</u>	
	<u>Males</u>	<u>Females</u>	<u>Males</u>	<u>Females</u>
50	\$ 9.452	\$ 9.959		
55	11.433	12.075		
60			\$14.138	\$14.895
65			12.437	13.141
70			10.621	11.207

On Retirement because of disability

<u>Age of Contributor at Retirement</u>	<u>Males</u>	<u>Females</u>
25	\$19.648	\$19.311
30	19.146	18.755
35	18.492	18.108
40	17.658	17.342
45	16.642	16.455
50	15.392	15.426
55	14.068	14.242
59	13.482	13.441

On Death leaving dependants entitled to annual allowance

<u>Age of Contributor at Death</u>	<u>Employed Male Contributors</u>	<u>Retired Male Contributors</u>
25	\$6.562	\$5.804
30	8.039	7.489
35	9.224	8.811
40	9.726	9.406
45	9.585	9.352
50	9.042	8.878
55	8.362	8.243
60	7.646	7.547
65	6.916	6.809
70	6.198	6.052
75		5.312
80		4.635
85		4.095
90		3.787

A P P E N D I X 13

Age	Proportion of contributors with salaries below "Year's Maximum Pensionable Earnings"		Ratio of average salary to "Year's Maximum Pensionable Earnings" for contributors below that maximum	
	Males	Females	Males	Females
18	0.993	1.000	0.735	0.664
19	0.972	0.994	0.750	0.681
20	0.936	0.970	0.765	0.699
21	0.836	0.917	0.779	0.715
22	0.684	0.876	0.791	0.732
23	0.566	0.839	0.803	0.747
24	0.477	0.809	0.813	0.761
25	0.410	0.783	0.823	0.774
26	0.359	0.763	0.831	0.786
27	0.322	0.747	0.838	0.796
28	0.292	0.735	0.845	0.804
29	0.269	0.726	0.850	0.811
30	0.252	0.718	0.854	0.817
31	0.240	0.712	0.857	0.822
32	0.230	0.708	0.861	0.826
33	0.223	0.704	0.864	0.830
34	0.218	0.701	0.866	0.832
35	0.214	0.698	0.869	0.834
36	0.210	0.695	0.871	0.836
37	0.208	0.692	0.872	0.837
38	0.206	0.689	0.873	0.839
39	0.204	0.685	0.874	0.840
40	0.203	0.681	0.875	0.841
41	0.202	0.676	0.875	0.842
42	0.201	0.670	0.876	0.843
43	0.201	0.664	0.877	0.843
44	0.200	0.656	0.878	0.844
45	0.200	0.648	0.878	0.843
46	0.200	0.640	0.878	0.843
47	0.199	0.632	0.878	0.842
48	0.199	0.623	0.877	0.842
49	0.199	0.614	0.877	0.841
50	0.199	0.604	0.876	0.841
51	0.199	0.595	0.876	0.840
52	0.199	0.587	0.875	0.840
53	0.199	0.579	0.875	0.840
54	0.199	0.571	0.874	0.839
55	0.199	0.564	0.872	0.839
56	0.199	0.558	0.870	0.838
57	0.199	0.552	0.868	0.837
58	0.199	0.547	0.866	0.836
59	0.199	0.543	0.864	0.835
60	0.199	0.539	0.861	0.833
61	0.199	0.536	0.858	0.831
62	0.199	0.533	0.854	0.829
63	0.199	0.531	0.851	0.826
64	0.199	0.530	0.848	0.823
65	0.199	0.529	0.843	0.820
66	0.199	0.528	0.839	0.817
67	0.199	0.527	0.833	0.814
68	0.198	0.526	0.828	0.810
69	0.198	0.526	0.822	0.807
70	0.198	0.525	0.815	0.804

A P P E N D I X 14

Age Distribution of employees who became contributors during the period from January 1, 1963, to December 31, 1967

Age	Males			Females		
	Number	Proportion of Total	Cumulative Proportion	Number	Proportion of Total	Cumulative Proportion
15	-	-	-	3	0.0%	0.0%
16	46	0.1%	0.1%	82	0.2	0.2
17	321	0.4	0.5	1,129	2.4	2.6
18	1,684	2.1	2.6	4,210	9.0	11.6
19	3,510	4.3	6.9	4,368	9.3	20.9
20	4,082	5.0	11.9	3,286	7.0	27.9
21	4,157	5.1	17.0	2,637	5.6	33.5
22	3,981	4.9	21.9	2,373	5.1	38.6
23	3,805	4.7	26.6	2,015	4.3	42.9
24	3,482	4.3	30.9	1,668	3.6	46.5
25	3,036	3.8	34.7	1,425	3.0	49.5
26	2,645	3.3	38.0	1,143	2.5	52.0
27	2,397	3.0	41.0	1,000	2.2	54.2
28	2,195	2.7	43.7	926	2.0	56.2
29	1,974	2.4	46.1	894	1.9	58.1
30	1,917	2.4	48.5	753	1.6	59.7
31	1,727	2.1	50.6	720	1.5	61.2
32	1,705	2.1	52.7	759	1.6	62.8
33	1,614	2.0	54.7	762	1.6	64.4
34	1,728	2.1	56.8	691	1.5	65.9
35	1,611	2.0	58.8	735	1.6	67.5
36	1,504	1.9	60.7	798	1.7	69.2
37	1,505	1.9	62.6	730	1.6	70.8
38	1,513	1.9	64.5	800	1.7	72.5
39	1,567	1.9	66.4	833	1.8	74.3
40	1,590	2.0	68.4	862	1.9	76.2
41	1,641	2.0	70.4	811	1.7	77.9
42	1,730	2.1	72.5	900	1.9	79.8
43	1,674	2.1	74.6	896	1.9	81.7
44	1,647	2.0	76.6	871	1.9	83.6
45	1,674	2.1	78.7	790	1.7	85.3
46	1,509	1.9	80.6	755	1.6	86.9
47	1,489	1.8	82.4	706	1.5	88.4
48	1,438	1.8	84.2	625	1.3	89.7
49	1,335	1.7	85.9	622	1.3	91.0
50	1,489	1.8	87.7	557	1.2	92.2
51	1,566	1.9	89.6	572	1.2	93.4
52	1,231	1.5	91.1	476	1.0	94.4
53	1,094	1.4	92.5	410	0.9	95.3
54	976	1.2	93.7	348	0.8	96.1
55	807	1.0	94.7	334	0.7	96.8
56	744	0.9	95.6	301	0.6	97.4
57	685	0.8	96.4	252	0.5	97.9
58	606	0.7	97.1	200	0.4	98.3
59	520	0.6	97.7	191	0.4	98.7
60	419	0.5	98.2	141	0.3	99.0
61	371	0.5	98.7	103	0.2	99.2
62	324	0.4	99.1	96	0.2	99.4
63	259	0.3	99.4	82	0.2	99.6
64	228	0.3	99.7	76	0.2	99.8
65 & over	226	0.3	100.0	87	0.2	100.0
All Ages	80,978			46,804		

Average Age: Males: 33.99 years; Females: 30.40 years