

Defence Services Pension Act - Part V

Report on Actuarial Valuation
of the
Permanent Services Pension Account in the Consolidated Revenue Fund
as at December 31, 1955

In accordance with instructions, we have completed an actuarial valuation of the Permanent Services Pension Account in the Consolidated Revenue Fund and have the honour to report thereon. This Account relates to the pension plan established by Part V of the Defence Services Pension Act. Part V of the Act applies to

- (a) persons who were enrolled as members of the forces* subsequent to March 31, 1946, and
- (b) persons who were members of the forces* on March 31, 1946, and who elected to become contributors under Part V on or before December 31, 1950.

Because of statutory requirements we have also made an actuarial valuation of the Permanent Services Pension Account as at August 31, 1955. Subsection (2) of section 65 of the Act provides that an actuarial valuation of the Permanent Services Pension Account shall be made once every five years. This provision came into force September 1, 1950, so that a valuation of the Account was required to be made as at a date not later than August 31, 1955. A summary of this valuation is given in Appendix A.

The main valuation of the Permanent Services Pension Account was made as at the end of the calendar year of 1955 for two reasons:

- (1) the procedures for the collection of the data and for the actuarial calculations are somewhat simpler when the end of a calendar year is used as the date of valuation; and
- (2) the past valuations of the Superannuation Account and the Royal Canadian Mounted Police Pension Account have been made as at December 31st dates, and it was thought preferable to keep consistent the valuation dates of the three Accounts.

Terms of the Pension Plan under Part V of the Act

Service: The term "service" is used in two senses under Part V of the Act:

- (1) the service of a contributor in the forces* together with the circumstances of his termination of service governs the type of benefit payable to him; service in this sense is termed service in the forces;
- (2) for the purpose of making contributions and of computing pensions or gratuities, service includes time served in the Civil Service, in the Royal Canadian Mounted Police, in the auxiliary or reserve forces and on active service during time of war as well as time served in the forces*; service in this sense is termed countable service in this report.

Benefits: The benefit provisions of Part V of the Act as at December 31, 1955, are summarized below:

* that is, "forces" as defined in Part V of the Defence Services Pension Act.

Summary of Benefits

| <u>Type of Termination</u> | <u>Service in the Forces</u> | |
|---|-----------------------------------|--|
| | <u>Under 10 years</u> | <u>10 years or over</u> |
| Compulsory retirement because of (a) attainment of prescribed age limit for rank (note 1); (b) reduction in establishment; (c) promotion of economy or efficiency in the forces. | Gratuity (note 2). | (i) A contributor with 20 years or over - annual pension (note 3); (ii) a contributor with 10 years or over, who served on active service during World War II, who was not in the forces June 1, 1944, and who joined the forces on or before December 31, 1948 - annual pension; (iii) a contributor with 10 to 20 years but not entitled to annual pension under (ii) above - reduced annual pension (note 4). |
| Retirement because of disability. | Gratuity. | Annual pension. |
| Voluntary retirement at end of period of engagement - does not apply to officers. | Refund of contributions (note 5). | (i) A contributor with 10 to 20 years - refund of contributions; (ii) a contributor with 20 to 25 years - reduced annual pension (note 6); (iii) a contributor with 25 years or over - annual pension. |
| Voluntary retirement - all cases not covered above. | Refund of contributions. | Refund of contributions. |
| Retirement because of inefficiency. | Refund of contributions. | Reduced annual pension (note 7). |
| Retirement because of misconduct. | Refund of contributions. | Refund of contributions <u>or</u> reduced annual pension (note 8). |
| Death in service leaving no widow or children. | Refund of contributions. | Refund of contributions. |
| Death in service or on pension leaving widow and/or children. | Gratuity (death in service only). | Annual pension to widow and/or children (note 9). |

- Note 1: Prescribed age limits for retirement depend upon rank; they range from age 45 to age 55.
- Note 2: Gratuity in the above summary means one month's pay and allowances at the rate in effect at date of termination for each year of countable service.
- Note 3: Annual pension to a contributor in the above summary means 2% of average pay and allowances during the last 6 years of his service for each year of countable service up to 35 years.
- Note 4: A reduced annual pension to a contributor with 10 to 20 years service in the forces means (a) if he is retired because of attainment of prescribed age limit for rank, an annual pension reduced by 1% for each complete year of service in the forces less than 20, and (b) if he is retired because of reduction in establishment or for promotion of economy or efficiency in the forces, an annual pension reduced by one-third until age 65.
- Note 5: Refund of contributions in the above summary means return of a contributor's total contributions without interest.
- Note 6: A reduced annual pension to a contributor, other than an officer, with 20 to 25 years service in the forces who is retired at the end of a period of engagement at his own request means an annual pension reduced by 5% for each complete year of service in the forces less than 25.
- Note 7: A reduced annual pension to a contributor retired because of inefficiency means an annual pension reduced by one-half until age 65 and by one-third thereafter.
- Note 8: A reduced annual pension as described in note 7 may be granted to a contributor retired because of misconduct upon the recommendation of the Minister and approval by the Treasury Board.
- Note 9: An annual pension to the widow of a contributor means one-half of the annual pension that would have been payable to the contributor had he been retired because of disability at the date of his death or retirement; it is suspended during any period of remarriage. An annual pension to a child of a contributor means one-fifth of the widow's pension described above to a maximum of \$300; it is payable until age 18. The maximum amount of pension payable to widow and children is 150% of the widow's pension. If both parents are dead, a child's pension is doubled; the maximum amount of pension payable to orphaned children is 100% of the widow's pension.
- Further note: If a contributor's total contributions exceed the aggregate of all benefit payments made to or in respect of him, the excess is returned to his dependent children over 18, if any, or, if none, to his estate.

Contributions:

By contributor -

(a) Current Service

The rates of contribution for members of the forces who come under Part V of the Act are as follows:

- (i) for members in receipt of pay and allowances of \$1200 per annum or less, 5% thereof;
- (ii) for members in receipt of pay and allowances over \$1200 but not over \$1500 per annum, 5½% thereof;
- (iii) for members in receipt of pay and allowances over \$1500 per annum, 6% thereof.

At the date of valuation, there were relatively few members of the forces contributing at the rate of 5½% and none contributing at the rate of 5%. No contributions are made in respect of countable service in excess of 35 years.

(b) Prior Service

(i) Under section 48 - This section provides that any contributor may, within one year after he becomes a contributor, elect to contribute under Part V in respect of the whole or any part of his countable service prior to becoming a contributor. The contribution required is an amount equal to the total contributions that would have been made during that service on the basis of the rates given above for current service together with simple interest at 4% per annum to the date of election. The amount may be paid in a lump sum or by monthly instalments for life, or for a period of years or life whichever is the shorter. Monthly instalments are computed 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.

(ii) Under subsection (2) of section 56 - This subsection provides that, where a person who becomes a contributor under Part V by election has prior service in the forces that could be counted as service for the purpose of pension under any other part of the Act and for which he was not required to contribute, that service may be counted for the purpose of computing a gratuity or pension under Part V. Contributions are not required for such service until a gratuity or a pension becomes payable to the contributor. At that time an amount equal in value to 5% of the aggregate pay and allowances that the contributor received for such service is deducted from the gratuity in a lump sum or from the pension by monthly deductions for life. A person who is contributing for this type of service by monthly deductions from his pension may pay the commuted value of future deductions in a lump sum at any time after pension payments have started. The above mentioned monthly deductions and the commuted value of future deductions are computed 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 -

Subsection (2) of section 63 of the Defence Services Pension Act and the relevant regulation provide that interest be credited quarterly to the Permanent Services Pension Account at the rate of 1% of the balance to the credit of the Account at the end of the preceding quarter. The Act makes no specific provision for any other government contribution to the Account. However, as a matter of practice, government contributions equal to one and two-thirds of members' contributions in respect of both current service and prior service have been made to the Permanent Services Pension Account since that Account was established in 1946. Although this rate of contribution was fixed more or less arbitrarily because of the lack of precise information, it was hoped that the combined members' and government rate of contribution of approximately 16% of pay and allowances would be adequate to pay for the benefits provided under Part V of the Act.

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Data

Valuation data for contributors active at the date of valuation and for contributors whose status as active contributors had terminated prior to that date were provided by the pension sections of the three services - Navy, Army and Air Force. Data for pensioners were provided by the pension section of the Treasury Office staff attached to the Department of National Defence. The collected statistics were then turned over to the National Defence Personnel Machine Records Bureau where they were transferred to punched cards specially designed for the valuation. The preparation of all the data was coordinated and controlled by the Pension Sub-committee of the Inter-service Pay Committee of the Department of National Defence.

From the completed punched cards the Dominion Bureau of Statistics computed ages and durations and made the sortings and tabulations of the data as required for the valuation of benefits and contributions and for ancillary investigations.

The following table shows, for the period from the inception of the plan in 1946 until December 31, 1955,

- (a) the number of persons who became contributors to the plan established by Part V and the number whose status as active contributors terminated, according to reason for termination, and
- (b) the number of persons who became pensioners and the number whose status as pensioners terminated, according to reason for termination.

It also shows the number of active contributors and pensioners at the date of valuation.

(a) Active Contributors

| | <u>Entrants</u> | <u>Terminations</u> | | | | <u>Active at Dec. 31, 1955</u> | |
|----------------|-----------------|-----------------------------------|----------------|----------------------------------|---------------------------------|------------------------------------|-----------------------------|
| | | <u>Compulsory Retirement*</u> | | <u>Disability Retirement</u> | <u>Voluntary Retirement</u> | | <u>Death in Service</u> |
| | | <u>Class 1</u> | <u>Class 2</u> | | | | |
| <u>Males</u> | | | | | | | |
| Officers | 14,816 | 221 | 372 | 91 | 1,176 | 170 | 12,786 |
| Other ranks | 165,161 | 958 | 26,976 | 3,961 | 36,464 | 1,192 | 95,610 |
| Total | 179,977 | 1,179 | 27,348 | 4,052 | 37,640 | 1,362 | 108,396 |
| <u>Females</u> | | | | | | | |
| Officers | 523 | 5 | 52 | 7 | 182 | 3 | 274 |
| Other ranks | 6,907 | 27 | 393 | 75 | 3,716 | 5 | 2,691 |
| Total | 7,430 | 32 | 445 | 82 | 3,898 | 8 | 2,965 |
| Grand Total | 187,407 | 1,211 | 27,793 | 4,134 | 41,538 | 1,370 | 111,361 |

* Class 1: Retirements because of age, reduction in establishment, or promotion of economy or efficiency in the forces;
Class 2: Retirements because of inefficiency or misconduct or reasons akin thereto.

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(b) Pensioners

Retired Contributors

| | <u>Pensions Granted</u> | <u>Pensions Terminated</u> | | <u>On Pension at Dec. 31, 1955</u> |
|-------------------------------------|-----------------------------|----------------------------|-----------------------|--|
| | | <u>Death</u> | <u>Other*</u> | |
| <u>Males</u> | | | | |
| Retirements other than disability** | 338 | 7 | 3 | 328 |
| Disability retirements | <u>138</u> | <u>8</u> | <u>0</u> | <u>130</u> |
| Total | 476 | 15 | 3 | 458 |
| <u>Females</u> | | | | |
| Retirements other than disability** | 4 | 0 | 0 | 4 |
| Disability retirements | <u>1</u> | <u>0</u> | <u>0</u> | <u>1</u> |
| Total | 5 | 0 | 0 | 5 |
| <u>Widows</u> | | | | |
| | <u>Pensions Granted</u> | <u>Pensions Terminated</u> | | <u>On Pension at Dec. 31, 1955</u> |
| | | <u>Death</u> | <u>Remarriage</u> | |
| | 79 | 1 | 10 | 68 |
| <u>Children</u> | | | | |
| | <u>Pensions Granted</u> | <u>Pensions Terminated</u> | | <u>On Pension at Dec. 31, 1955</u> |
| | | <u>Death</u> | <u>Reached age 18</u> | |
| | 138 | 0 | 13 | 125 |
| Grand total | 698 | 16 | 26 | 656 |

* Terminations by reason of reenlistment or transfer of credit to Superannuation Account.

** Retirements to pension because of age, reduction in establishment, promotion of economy or efficiency in the forces, inefficiency or misconduct, and, for other ranks, voluntary retirements with service of 20 years or more.

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Valuation Bases

General

Data for active contributors and for persons whose status as active contributors had terminated were provided, separately, for (a) male officers, (b) male other ranks, (c) female officers, and (d) female other ranks. Throughout the remainder of this report, the term "classes of active contributors" will refer to these four groups.

Preliminary examination of the data showed that both the rates of increase in pay and allowances from age to age, and the probabilities of termination were quite different for the four classes. Therefore, although the data for the two female classes were relatively few, it was felt necessary to choose appropriate bases for the valuation of benefits and contributions for each class separately.

Data for pensioners were provided, separately, for (a) retired male contributors, (b) retired female contributors, (c) widows, and (d) children. These classes were kept separate for valuation purposes.

1. Interest

The Defence Services Pension Part V Regulations provide that interest shall be credited to the Permanent Services Pension Account at the rate of 1% quarterly, that is, at the rate of 4% per annum, approximately. The interest basis for the valuation was therefore taken as 4% per annum.

It may also be mentioned that, where an interest basis is necessary for calculations under the Act, the Regulations prescribe the interest basis to be 4% per annum. For example, the Regulations prescribe 4% as the interest basis for the computation of monthly instalments equivalent to an amount of arrears of contributions for prior service.

2. Rates of Increase in Pay and Allowances

It was necessary to determine the rates at which pay and allowances will, on the average, increase from age to age in the future for the following reasons:

- (a) pension benefits depend upon the average pay and allowances received during the last six years of service;
- (b) gratuity benefits depend upon the rate of pay and allowances being received at termination of service; and
- (c) future current service contributions depend upon the pay and allowances received during each future year of service.

The valuation data included the rate of pay and allowances of each active contributor at December 31, 1955, whence the average salary of contributors of each class was obtained for each age. Also, listings were obtained from each of the three services which showed the distribution of service members by year of birth and by service rank.

From these and other relevant data, scales of pay and allowances were determined for the four classes of active contributors. They are set out in Appendix B1. Appendix B2 shows, for specimen ages, how pay and allowances of \$1,000 would increase in the future on the basis of the scales of pay and allowances shown in Appendix B1.

The scale for male officers exhibits an interesting feature at the younger ages. For this class, average pay and allowances remain low and

stable until age 20. Over the next few years of age, the average increases very rapidly until, at age 26, it is almost $2\frac{1}{2}$ times as great as the level at age 21. This feature is a result of the officer cadet training program used by the three services.

The progressions of pay and allowances shown in Appendix B1 are those that may normally be expected to hold in the future. No provision was made in the rates for increases in the general level of pay and allowances after the date of valuation.

3. Mortality and Remarriage

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

- (a) the four classes of active contributors, namely,
 - (i) male officers, (ii) male other ranks, (iii) female officers, and (iv) female other ranks;
- (b) male and female contributors retired to pension for reasons other than disability;
- (c) male and female contributors retired to pension because of disability;
- (d) widows of active and retired contributors;
- (e) children of active and retired contributors.

Widows' pensions are suspended during any period of remarriage. Thus, rates of remarriage were needed for their valuation.

The bases used in the valuation are described in the following paragraphs.

(a) Active contributors

The probabilities of death for male officers and male other ranks were based on the actual mortality experience among the members of these classes during the period from September 1, 1946, to December 31, 1955. For both of these classes, the series of probabilities at the younger ages exhibit humps which appear abnormal in comparison with the mortality experience among most groups of persons outside the services. For male officers, the probabilities of death rise gradually to age 27 then decrease to age 35 and it is not until age 41 that they become greater than the probability for age 27. For male other ranks, the probabilities of death rise sharply to age 21 then fall gradually to age 30 and finally at age 40 become greater than the probability for age 21. This experience reflects the relatively high number of deaths at the younger ages from accidents and from the police action in Korea.

The probabilities of death for female officers and other ranks had to be chosen arbitrarily. During the experience period of almost $9\frac{1}{2}$ years there were only three deaths among female officers and five deaths among female other ranks. It was considered that mortality among female contributors would be light because (a) it is unlikely that the female classes are subject to the high incidence of accident mortality at the younger ages as appears to be the case for the male classes, (b) in general, members of the services are subject to rigid medical selection at inception of service and good medical care throughout service, and (c) most females terminate service upon marriage and thus are not subject to mortality from childbirth or associated illnesses while they are active contributors. The probabilities of death used for both female classes were developed from the female mortality rates of the α -1949 Table Projected 10 Years. This table seemed particularly

appropriate since the rates at the younger ages were based on the experience among active lives under group annuity contracts covering predominantly clerical employees.

The probabilities used for the four classes of active contributors are set out in Appendix B3.

(b) Contributors retired to pension for reasons other than disability

This group of pensioners included all retirements to pension because of age, reduction in establishment, promotion of economy or efficiency in the forces, inefficiency, misconduct and, for other ranks, voluntary retirements after 20 years of service.

The experience was very small but, where possible, it was used to test various mortality bases. The bases chosen may reasonably be expected to represent the mortality experience of the future.

The probabilities of death used for valuation were:

- (1) for male contributors in receipt of pension at date of valuation - the male mortality rates of the α -1949 Table;
- (2) for male contributors retired to pension after date of valuation - the male mortality rates of the α -1949 Table Projected 10 Years;
- (3) for female contributors in receipt of pension at date of valuation and those retired to pension after date of valuation - the female mortality rates of the α -1949 Table Projected 10 Years.

The described probabilities of death for decennial ages and the relevant annuity values for the same ages are set out in Appendix B4.

(c) Contributors retired to pension because of disability

The probabilities of death used in the valuation for both disability pensioners drawing pension at date of valuation and those retired to pension after that date were based on a modification of the Canadian Life Table, 1951, Males or Females, as applicable. They are shown in Appendix B5 for decennial ages.

The probabilities just described would have produced about the same number of deaths among male disability pensioners as actually occurred in the pre-valuation period.

It is recognized that mortality among disabled persons depends upon duration from disablement as well as upon age. However, the group of contributors retired to pension because of disability was too small and deaths too few to obtain any indication of the mortality pattern according to duration from date of retirement.

Also shown in Appendix B5 are relevant annuity values for decennial ages.

(d) Widows of active and retired contributors

The bases chosen for the valuation of pensions both of widows now drawing pension and of prospective widows of present active and retired contributors were (1) for mortality - the female rates of the α -1949 Table Projected 10 Years, and (2) for remarriage - the select and ultimate remarriage rates derived from the experience among widows awarded pensions under the Pension Act from the beginning of World War I to March 31, 1939.

In Appendix B6 are shown select and ultimate remarriage rates for specimen ages and durations, mortality rates for specimen ages, and annuity values based on the probabilities of pension payments ceasing as a result of death or remarriage for specimen ages and durations.

(e) Children of active and retired contributors

Pension payments to children cease at age 18. Since the mortality of children under age 18 is very low, it was deemed sufficiently accurate to value children's pensions without taking account of mortality.

4. Probabilities of retirement to pension or gratuity for reasons other than disability

These probabilities pertain to contributors who are retired for reasons other than disability and are granted either a monthly pension or a gratuity of one month's pay and allowances for each year of countable service.

Series of probabilities were derived from the experience for male officers to age 44 and for male and female other ranks to age 49.

For both officers and other ranks, compulsory release ages according to rank are prescribed for the three services, covering the range from age 45 to age 55 for officers and from age 50 to age 55 for other ranks. During the experience period a relatively large number of extensions beyond the prescribed ages were granted mainly because of the change-over to enlarged peace-time establishments after World War II. Under normal conditions in the future, retirements are expected to take place at the compulsory release ages in all but exceptional circumstances. Thus, past experience could not be relied upon to forecast probabilities that will apply in the future for the ranges of compulsory release ages.

The probabilities used in the valuation for ages 45 to 54 for officers and for ages 50 to 54 for other ranks were based on information supplied by the personnel staffs of the three services. The probabilities for age 55 give effect to the assumption that all persons remaining in the services at age 55 will die or retire in that year of age.

Probabilities for female officers could not be estimated from the limited experience available. They were assumed to be the same as those derived for male officers.

Complete series of probabilities for the four classes are set out in Appendix B7.

5. Probabilities of retirement because of disability

Except for female officers, probabilities of retirement because of medical unfitness were derived from the experience. They are set out in Appendix B8.

The pattern of probabilities for female officers could not be closely judged because of the small experience. It was assumed that the probabilities for this class would be on a slightly higher plane than for male officers at the younger ages and would coincide with those for female other ranks at and after age 36.

The series of probabilities by age show two significant features:

- (1) for male other ranks and female other ranks the probabilities rise sharply to peaks in the early twenties then fall off rapidly till the mid-thirties but the probabilities for male officers do not show this tendency;
- (2) the probabilities for officers are much lower than for other ranks.

6. Probabilities of termination of service with refund of contributions

These probabilities pertain to all contributors who are granted a refund of their own contributions without interest on their release.

The series of probabilities, derived from the experience, are set out in Appendix B9.

7. Proportions of male contributors married at death

These proportions were needed to value prospective benefits in respect of future widows of active and retired contributors.

From the experience, proportions were developed for the active contributor classes of male officers and male other ranks and for male retired contributors. They are shown for quinquennial ages in Appendix B10.

Theoretically, pensions are payable to widowers of female contributors. However, the number of married female contributors in the services is so small that it could reasonably be assumed that the proportion of female contributors leaving widowers at death is zero for every age.

8. Average ages of widows corresponding to ages of contributors at death

For each age at death of contributors, the average age of widows left on the death of their contributor husbands was needed to calculate the values of widows' pensions then emerging.

Information to determine these average ages was obtainable only from the widows' data which were very few and were not classified according to the officer or other rank status of the deceased contributors. Thus, the average ages of widows corresponding to the ages of contributors at death were assumed to be the same both for the active contributor classes of male officers and male other ranks and for retired contributors. The derived ages are shown for quinquennial ages of contributors at death in Appendix B10.

9. Children's benefits

For each age at death of contributors there was needed the value of children's benefits per \$1.00 of the pension that would have been payable to the contributor had he been retired because of disability at the date of his death.

The data for children included the number of children who were eligible for pension on the death of their contributor fathers and the age of each such child. From these data the values described in the preceding paragraph were derived. They are shown for quinquennial ages of contributors at death in Appendix B10.

10. Capitalized values of pension benefits

In Appendix B11 are shown, for quinquennial ages, the values of pension benefits emerging

- (a) on retirement to pension for reasons other than disability,
- (b) on retirement to pension because of disability, and
- (c) on death leaving dependents eligible for pension.

For male retirements, the values include provision for prospective pensions to widows and children. For all cases except deaths of retired contributors, the values include provision for the minimum benefit payable, namely, an aggregate amount of benefit equal to the contributor's total contributions without interest.

Contribution Rates

For any pension plan where benefits are based on final salaries or on an average of salaries received over the last few years of service, a general increase in the level of salaries creates an extra liability in the pension account. In establishing the contribution rates set out in this section, the effect of general increases in the level of pay and allowances to contributors under Part V of the Act that have taken place in the past or that may take place in the future has not been taken into account. The effect of such increases on the state of the Permanent Services Pension Account will be discussed later.

As described earlier in this report, in general, contributions of contributors for current service are equal to 6% of current pay and allowances, and contributions of contributors for periods of prior service are based on 6% of the pay and allowances received during those periods. Also, to the present time, government contributions have equalled one and two-thirds of all contributions made by contributors. Thus, total contributions to the Permanent Services Pension Account are made at a rate of approximately 16% of the pay and allowances received by contributors during any period of service countable for pension purposes.

The contribution rates required to pay for the benefits provided by Part V vary by class of contributor and by the age of the contributor at entry, i.e., at the beginning of countable service. The following schedule shows the rates at sample ages at entry for each of the classes of active contributors and the average rate for each class based on the distribution of pay and allowances of active contributors at December 31, 1955, by age at entry.

Contribution Rate as Percentage of Pay and Allowances

| <u>Age at Entry</u> | <u>Class of Contributor</u> | | | |
|---------------------|-----------------------------|--------------------|-----------------|--------------------|
| | <u>Males</u> | | <u>Females</u> | |
| | <u>Officers</u> | <u>Other Ranks</u> | <u>Officers</u> | <u>Other Ranks</u> |
| 20 | 25.01% | 11.03% | 9.42% | 5.75% |
| 25 | 24.70 | 14.20 | 13.23 | 6.58 |
| 30 | 25.98 | 17.38 | 19.10 | 9.46 |
| 35 | 27.25 | 20.44 | 23.96 | 14.79 |
| Weighted average | 24.88% | 12.54% | 16.59% | 6.07% |

For all classes combined, a contribution rate of 15% of pay and allowances would be sufficient to pay for the benefits of new contributors provided that (a) their age distribution at entry and the relative proportions among the four classes were about the same as for active contributors at the date of valuation, and (b) there were no general increases in the level of pay and allowances.

As respects current contributors, the question of an appropriate contribution rate is complicated by elections for prior service, general increases in the level of pay and allowances that have taken place in the past and a changing proportion of officers to other ranks within the contributor group. These complications will be discussed in a later section.

The above schedule shows that the average contribution rate required to pay for benefits in respect of male officers is almost twice as

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great as the corresponding rate for male other ranks. The reasons for this difference are

- (1) the termination rates for officers in the earlier years of service are much lower than for other ranks - thus, (a) a much higher proportion of officers than of other ranks remain in the service to receive pension benefits and (b) relatively less is gained from the release of government contributions in respect of officers who terminate at the younger ages and receive a gratuity or a refund of contributions, than in respect of other ranks,
- (2) the proportion of officers at the higher ages who have dependents eligible for pension is greater than the corresponding proportion of other ranks - thus, the values of dependents' benefits are proportionately higher for officers than for other ranks,
- (3) the rates of increase in pay and allowances at the younger ages are much higher for officers than for other ranks - thus, the pensions that become payable, considered as a proportion of pay and allowances at the younger ages, are relatively greater for officers than for other ranks, and
- (4) the prescribed range of retirement ages for officers starts at an earlier age than the range for other ranks - thus, the average pensionable lifetime of officers and, therefore, the average value of \$1 of pension to officers are higher than for other ranks.

The schedule also shows that the average required contribution rate for female officers is much less than for male officers. The reasons are that termination rates at the younger ages are much higher for female officers than for male officers, the scale of pay and allowances for female officers is much less steep at the younger ages than is the scale for male officers, and dependents' benefits in respect of females are negligible.

Finally, the schedule shows that benefits for female other ranks are almost covered by the contributions of the contributors themselves. This is mainly the result of very high termination rates at the younger ages.

In the following schedule, the average contribution rates for the four classes of active contributors are broken down into the contribution rates required to provide the benefits payable to (a) contributors, (b) dependents of contributors, and (c) estates of contributors. Benefits payable to a contributor consist of pension, gratuity and refund of contribution benefits which may become payable to him. Benefits payable to the dependents of a contributor consist of pension and gratuity benefits which become payable to the surviving widow and children under age 18 on the death of a contributor. Benefits payable to the estate of a contributor consist of a refund of contributions on the death of an active contributor leaving no dependents or, in any other event, the refund of the excess, if any, of the contributions of a contributor over the aggregate benefits received by him and his dependents up to the time benefits cease.

| <u>Class</u> | <u>Contribution Rates for Benefits payable to</u> | | | |
|--------------|---|-------------------|---------------|--------------|
| | <u>Contributor</u> | <u>Dependents</u> | <u>Estate</u> | <u>Total</u> |
| Males: | | | | |
| Officers | 21.98 | 2.89 | .01 | 24.88 |
| Other ranks | 11.15 | 1.36 | .03 | 12.54 |
| Females: | | | | |
| Officers | 16.50 | - | .09 | 16.59 |
| Other ranks | 6.06 | - | .01 | 6.07 |

Valuation Summary

The following balance sheet summarizes the results of the valuation. It also shows the financial status of the Permanent Services Pension Account as at December 31, 1955, assuming that the government will continue contributing to the Account at the rate that has been in effect since the inception of Part V.

Permanent Services Pension Account

Valuation Balance Sheet as at December 31, 1955

| | | <u>Assets</u> | |
|--|------------------|----------------|------------------------|
| Balance of Account | | | \$327,756,000 |
| Contributions due: | | | |
| Contributors | \$1,688,000 | | |
| Government | <u>4,025,000</u> | | 5,713,000 |
| Present value of future contributions from contributors: | | | |
| <u>Active contributors</u> | | | |
| <u>Current service</u> | | | |
| Males:-Officers | \$46,051,000 | | |
| Other ranks | 140,758,000 | | |
| Females:-Officers | 483,000 | | |
| Other ranks | <u>1,190,000</u> | \$188,482,000 | |
| <u>Prior service - section 48</u> | | | |
| Males:-Officers | \$3,343,000 | | |
| Other ranks | 5,883,000 | | |
| Females:-Officers | 9,000 | | |
| Other ranks | 2,000 | | |
| <u>Prior service - section 56(2)</u> | | | |
| Males:-Officers | 631,000 | | |
| Other ranks | <u>880,000</u> | 10,748,000 | |
| <u>Retired contributors</u> | | | |
| <u>Prior service</u> | | | |
| Males | \$318,000 | | |
| Females | <u>1,000</u> | <u>319,000</u> | 199,549,000 |
| Present value of future contributions from government: | | | <u>332,582,000</u> |
| | Total Assets | | \$865,600,000 |
| Deficit | | | <u>\$214,589,000</u> |
| | | | <u>\$1,080,189,000</u> |

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Liabilities

Present value of prospective
benefits to active contributors:

Males: -Officers \$415,037,000
Other ranks 650,711,000
Females: -Officers 3,690,000
Other ranks 2,108,000

\$1,071,546,000

Present value of benefits
to present pensioners:

Retired contributors: -Males \$7,645,000
Females 80,000 \$7,725,000

Widows 607,000

Children 84,000

8,416,000

Contributions held pending refund
to discharged members

227,000

\$1,080,189,000

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Deficit

From the foregoing balance sheet it is seen that the Account was in deficit by about \$214 million as at December 31, 1955. The actual amount of the deficit is dependent on the assumption that the government would continue to make contributions equal to one and two-thirds of members' contributions, that is, that the combined contributor and government contribution rate would continue to be 16% of pay and allowances.

The deficit developed mainly from two sources:

- (1) a liability in respect of prior service in excess of the value of contributions therefor; and
- (2) net liabilities created by each of the general increases in pay and allowances between September, 1946, and December, 1955.

Other less important sources accounted for the small remaining part of the deficit.

The deficit and its sources are discussed in the following paragraphs.

Liability in respect of prior service

In any pension plan with terms similar to those of Part V of the Defence Services Pension Act, if the total contribution rate is set so that contributions payable from the beginning of service to cessation of service are just sufficient to pay for the benefits of new members with no prior service, a net liability results from every election to contribute for prior service. The reason for this may be explained fairly simply. The contribution rate provides for all benefits under the plan but the values of the different benefits vary widely. The pension benefits have by far the greatest value of all benefits and a large part of the contributions made in respect of all members have to be set aside to provide for the pensions of those members who stay in service to receive them. In other words, the contributions in respect of the individual member are not sufficient to pay for his major benefits; they must be augmented by employer contributions and interest released in respect of those who leave the service and get a refund of their own contributions without interest, or some similar benefit. For a member's service prior to his joining the plan, there is, in effect, no such release of employer contributions and interest. Thus, the liability created when a member elects to contribute for prior service is not met by contributions payable in respect of that service.

The initial group of active contributors under Part V consisted mainly of persons who enlisted during World War II. As such, they were eligible to elect to contribute in respect of some years of prior service and most of them did so. For the purposes of this section there must also be included (a) those persons who were members of the forces on April 1, 1946, and elected to come under Part V bringing with them countable prior service, and (b) those persons who were not in the forces on April 1, 1946, but who later re-enlisted bringing with them countable service prior to September 1, 1946, for which they elected to contribute.

Earlier in this report it was indicated that, in the absence of a deficit in the Account or general increases in pay and allowances, an average contribution rate of 15% from the beginning of service to cessation of service in respect of each contributor would be sufficient to pay for the benefits set out in Part V of the Act. This rate of contribution was determined on the basis of the distribution of active contributors among the four classes as at December 31, 1955. If, at any time, the proportion of officers to other ranks were greater than such proportion at December 31, 1955, an average contribution rate of 15% would not be sufficient. Also, such contribution rate is heavily dependent on the release of government contributions and interest in respect of those contributors who leave the service and are paid a gratuity or a refund of their own contributions.

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For the group of active contributors who elected to contribute for countable service prior to September 1, 1946, the 16% contributions actually received in respect of that service were not sufficient to pay for benefits based on that service because

- (1) the effective proportion of officer contributors to other rank contributors was much higher than the proportion as at December 31, 1955, and
- (2) there was no release of government contributions and interest in respect of those periods of service.

For the group of active contributors who elected to come under Part V and brought with them service that could be counted as service under any other part of the Act for which they were not required to contribute, the contributions to be received in respect of that service were particularly deficient. For that service, members' contributions at the rate of 5% of aggregate pay and allowances received are required to be paid at the time a gratuity or a pension becomes payable to the contributor. Thus, total contributions for such service equal $13 \frac{1}{3}\%$ of the aggregate pay and allowances received, assuming government contributions to equal one and two-thirds of members' contributions. Besides this basic deficiency in contributions, there is a loss to the Account of interest on the required contributions from the time of the prior service to the date contributions become payable. Also, in the event of death leaving dependents of such contributor, no contributions are received for that period of service although it enters into the computation of the gratuity or pensions payable to the dependents.

There is one other reason why contributions in respect of service prior to September 1, 1946, were deficient. As at October 1, 1946, the several components of pay and allowances were placed on a monthly basis and some of the components were increased. Thus, in many cases, contributions in respect of service prior to the inception of Part V were based on rates of pay and allowances lower than the rates that became effective on October 1, 1946. In effect, a general increase in pay and allowances took place as at October 1, 1946, for those contributors with countable service prior to that date. This produced an extra liability in the Account in the manner explained in the next section.

As a result of these several circumstances, it is estimated that the liability in respect of service prior to September 1, 1946, exceeded the value of contributions to be applied against it by an amount in the neighbourhood of \$45 million. In other words, the Permanent Services Pension Account really started with a deficit of about \$45 million.

In an actuarial valuation, it is assumed that interest will be earned on the full actuarial reserve, that is, on the amount which, together with future contributions, is required for payment of future benefits. Thus, if the balance in the Account at any time is less than the full reserve, that is, if there is a deficit, there is a loss to the Account equal to the amount of the interest on the deficit over any period during which the deficit is allowed to stand and the deficit increases accordingly over that period. Consequently, the deficit in respect of prior service had grown to about \$65 million by the end of 1955.

Liability created by general increases
in pay and allowances

If a pension account is in balance at a certain date, the balance standing to the credit of the account together with the value of future contributions must be equal to the value of future benefits. In the event of a general salary increase at that date, there is created in the account a net liability, i.e., a deficit, equal to the difference between the increase in the value of benefits dependent upon future salary and the increase in the

value of contributions dependent upon future salary because, clearly, the balance standing to the credit of the account at that date does not change. If the pension account has a deficit before the general salary increase then the deficit is increased by an amount equal to the net liability created by the increase.

In the period between the inception of Part V and December 31, 1955, there were six general increases in the pay, in the allowances, or in both pay and allowances of active contributors to the Permanent Services Pension Account. The average increase in pay and allowances over this period was about 52% for officers and 75% for other ranks. The following schedule shows, for each date of increase, the estimated average percentage increase for officers and other ranks separately, the estimated net liability created by each increase and the accumulated amount of the net liability as at December 31, 1955, on the basis of interest at 4% per annum.

| Date of Increase | Average Percentage Increase | | Net liability created | Accumulated amount as at December 31, 1955 |
|------------------|-----------------------------|-------------|-----------------------|--|
| | Officers | Other Ranks | | |
| | Oct. 1, 1947 | 8.0% | | |
| Oct. 1, 1948 | 5.3 | 9.4 | 7,000,000 | 9,300,000 |
| Dec. 1, 1950 | 9.6 | 9.6 | 16,500,000 | 20,100,000 |
| Dec. 1, 1951 | 9.8 | 11.2 | 28,000,000 | 32,900,000 |
| May 1, 1953 | 2.4 | 6.1 | 15,000,000 | 16,700,000 |
| Dec. 1, 1953 | 8.3 | 10.6 | 39,000,000 | 42,300,000 |
| Total | | | | \$132,400,000 |

Other sources of deficit

As described in the preceding paragraphs, it has been estimated that about \$200 million of the \$214 million deficit in the Account as at December 31, 1955, may be attributed to two main sources.

Another circumstance which has brought about a fairly substantial part of the deficit is the promotion of senior non-commissioned officers and warrant officers to officer ranks. This type of promotion produces, in effect, a general increase in pay and allowances to the contributor concerned with the consequent creation of a net liability in the manner explained previously.

Most of the remaining portion of the deficit may be accounted for by loss of interest resulting from delay in crediting members' contributions to the Account, and from the practice, prior to April 1, 1953, of crediting government contributions to the Account in one sum at the end of each fiscal year.

Increase in deficit subsequent to December 31, 1955

In 1956, a general increase in pay and allowances was made effective as at April 1st of that year. The average percentage increase was 7.1% for officer contributors and 8.7% for other rank contributors. The net liability created by this increase amounted to \$41,800,000. By March 31, 1957, this amount would have accumulated at interest to \$43,500,000.

Also, by March 31, 1957, the deficit of \$214,589,000 as at December 31, 1955, would have accumulated at interest to \$225,400,000.

Thus, the total deficit in the Permanent Services Pension Account as at March 31, 1957, would have been approximately \$269 million.

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Summary and Recommendations

If the proportion of officers to other ranks remains about the same as it was at December 31, 1955, and if the net liability arising as a result of a general increase in pay and allowances is credited to the Account at the time of the increase, then

- (a) the present combined contribution rate of about 16% from contributors and government is a little more than sufficient to pay for the benefits under Part V in respect of new contributors, and
- (b) if there were no deficit in the Account, that is, if the balance standing to the credit of the Account were equal to the actuarial reserve, the present 16% contribution rate, together with the balance in the Account, would be sufficient to pay for the benefits in respect of present active contributors and pensioners.

At present there is a large deficit in the Account which has resulted mainly from a deficiency of contributions in respect of prior service and from net liabilities created by general increases in pay and allowances from time to time. This deficit is continuously increasing because of interest.

The balance in the Permanent Services Pension Account in the government's balance sheet should represent the liability accrued in respect of benefits under Part V of the Defence Services Pension Act, as nearly as may be estimated. For this reason, it is recommended that the deficit in the Account be set up as a deferred charge so that it will not continue to grow with interest and that it be liquidated as soon as may reasonably be possible. It is also recommended that an amount equal to the net liability created by any future general increase in pay and allowances be credited to the Account at the time such increase is made effective.

In conclusion, it is a pleasure to acknowledge the co-operation and assistance given by the Dominion Bureau of Statistics and by the several contributing agencies of the Department of National Defence.

Respectfully submitted,



Chief Actuary

Department of Insurance,
June 13, 1957

A P P E N D I X A

Report on Actuarial Valuation

of the

Permanent Services Pension Account in the Consolidated Revenue Fund

as at August 31, 1955

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Valuation of the Permanent Services Pension Account
as at August 31, 1955

Many of the data supplied for the valuation of the Account as at December 31, 1955, were used, in amended form, for this valuation. Supplementary data were supplied and processed by the agencies described in the main report. The valuation functions used were those developed for the valuation of the Account as at December 31, 1955.

The numbers of active contributors and pensioners under Part V of the Act as at August 31, 1955, were as follows:

Active Contributors

| <u>Males</u> | | <u>Females</u> | | <u>Total</u> |
|-----------------|--------------------|-----------------|--------------------|--------------|
| <u>Officers</u> | <u>Other Ranks</u> | <u>Officers</u> | <u>Other Ranks</u> | |
| 12,322 | 96,129 | 281 | 2,749 | 111,481 |

Pensioners

| <u>Retired Contributors</u> | | <u>Widows</u> | <u>Children</u> | <u>Total</u> |
|-----------------------------|----------------|---------------|-----------------|--------------|
| <u>Males</u> | <u>Females</u> | | | |
| 437 | 5 | 65 | 120 | 627 |

The following balance sheet summarizes the results of the valuation. It also shows the financial status of the Permanent Services Pension Account as at August 31, 1955, assuming that the government will continue contributing to the Account at the rate that has been in effect since the inception of Part V.

Permanent Services Pension Account

Valuation Balance Sheet as at August 31, 1955

Assets

| | | | |
|--|------------------|----------------|------------------------|
| Balance of Account | | | \$300,106,000 |
| Interest due and accrued | | | 4,713,000 |
| Contributions due: | | | |
| Contributors | \$1,677,000 | | |
| Government | <u>2,550,000</u> | | 4,227,000 |
| Present value of future contributions from contributors: | | | |
| <u>Active contributors</u> | | | |
| <u>Current service</u> | | | |
| Males:-Officers | \$45,103,000 | | |
| Other ranks | 141,069,000 | | |
| Females:-Officers | 496,000 | | |
| Other ranks | <u>1,223,000</u> | \$187,891,000 | |
| <u>Prior service - section 48</u> | | | |
| Males:-Officers | \$3,481,000 | | |
| Other ranks | 6,100,000 | | |
| Females:-Officers | 11,000 | | |
| Other ranks | 2,000 | | |
| <u>Prior service - section 56(2)</u> | | | |
| Males:-Officers | 620,000 | | |
| Other ranks | <u>851,000</u> | 11,065,000 | |
| <u>Retired contributors</u> | | | |
| <u>Prior service</u> | | | |
| Males | \$299,000 | | |
| Females | <u>1,000</u> | <u>300,000</u> | 199,256,000 |
| Present value of future contributions from government: | | | <u>332,093,000</u> |
| Total Assets | | | \$840,395,000 |
| Deficit | | | <u>\$211,948,000</u> |
| | | | <u>\$1,052,343,000</u> |

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Liabilities

Present value of prospective benefits to active contributors:

| | | |
|-------------------|------------------|-----------------|
| Males:-Officers | \$402,637,000 | |
| Other ranks | 635,885,000 | |
| Females:-Officers | 3,645,000 | |
| Other ranks | <u>2,119,000</u> | \$1,044,286,000 |

Present value of benefits to present pensioners:

| | | |
|-----------------------------|---------------|-------------|
| Retired contributors:-Males | \$7,141,000 | |
| Females | <u>80,000</u> | \$7,221,000 |

| | | |
|--------|--|---------|
| Widows | | 567,000 |
|--------|--|---------|

| | | |
|----------|---------------|-----------|
| Children | <u>82,000</u> | 7,870,000 |
|----------|---------------|-----------|

Contributions held pending refund to discharged members

187,000

\$1,052,343,000

It may be noted that the increase in the deficit over the period from August 31, 1955, to December 31, 1955, was about \$2.6 million. This increase was due mainly to loss of interest on the deficit for the four-month period.

APPENDIX B

Scales of Pay and Allowances

Tables of Rates and Probabilities

Tables of Annuity Values

hc

B1Scales of Pay and Allowances

| <u>Age</u> | <u>Males</u> | | <u>Females</u> | |
|------------|-----------------|--------------------|-----------------|--------------------|
| | <u>Officers</u> | <u>Other Ranks</u> | <u>Officers</u> | <u>Other Ranks</u> |
| 15 | .1875 | .4571 | .5451 | .6069 |
| 16 | .1875 | .4720 | .5461 | .6137 |
| 17 | .1875 | .4892 | .5471 | .6239 |
| 18 | .1891 | .5104 | .5480 | .6383 |
| 19 | .1943 | .5362 | .5500 | .6580 |
| 20 | .2048 | .5698 | .5519 | .6867 |
| 21 | .2272 | .6090 | .5545 | .7284 |
| 22 | .2744 | .6490 | .5577 | .7791 |
| 23 | .3821 | .6852 | .5614 | .8101 |
| 24 | .4635 | .7154 | .5656 | .8267 |
| 25 | .5127 | .7412 | .5698 | .8350 |
| 26 | .5472 | .7636 | .5749 | .8389 |
| 27 | .5726 | .7841 | .5802 | .8411 |
| 28 | .5928 | .8029 | .5866 | .8434 |
| 29 | .6103 | .8197 | .5931 | .8464 |
| 30 | .6262 | .8357 | .5996 | .8509 |
| 31 | .6423 | .8510 | .6067 | .8566 |
| 32 | .6578 | .8656 | .6142 | .8641 |
| 33 | .6742 | .8793 | .6220 | .8736 |
| 34 | .6907 | .8924 | .6308 | .8839 |
| 35 | .7080 | .9051 | .6398 | .8944 |
| 36 | .7252 | .9167 | .6493 | .9050 |
| 37 | .7429 | .9271 | .6593 | .9142 |
| 38 | .7610 | .9361 | .6697 | .9228 |
| 39 | .7793 | .9443 | .6800 | .9308 |
| 40 | .7978 | .9515 | .6914 | .9383 |
| 41 | .8167 | .9574 | .7051 | .9456 |
| 42 | .8360 | .9631 | .7210 | .9527 |
| 43 | .8554 | .9679 | .7411 | .9587 |
| 44 | .8753 | .9720 | .7657 | .9641 |
| 45 | .8955 | .9753 | .7959 | .9694 |
| 46 | .9154 | .9787 | .8332 | .9735 |
| 47 | .9339 | .9821 | .8738 | .9774 |
| 48 | .9502 | .9847 | .9101 | .9807 |
| 49 | .9642 | .9873 | .9380 | .9837 |
| 50 | .9746 | .9899 | .9582 | .9868 |
| 51 | .9834 | .9922 | .9724 | .9894 |
| 52 | .9899 | .9944 | .9828 | .9920 |
| 53 | .9945 | .9963 | .9905 | .9947 |
| 54 | .9977 | .9981 | .9964 | .9974 |
| 55 | 1.000 | 1.000 | 1.000 | 1.000 |

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Illustration of Increase in Pay and Allowances

| <u>Age</u> | <u>Males</u> | | | | <u>Females</u> | | | |
|------------|-----------------|---------|--------------------|---------|-----------------|---------|--------------------|---------|
| | <u>Officers</u> | | <u>Other Ranks</u> | | <u>Officers</u> | | <u>Other Ranks</u> | |
| 20 | \$1,000 | | \$1,000 | | \$1,000 | | \$1,000 | |
| 25 | 2,503 | | 1,301 | | 1,032 | | 1,216 | |
| 30 | 3,058 | \$1,000 | 1,467 | \$1,000 | 1,086 | \$1,000 | 1,239 | \$1,000 |
| 35 | 3,457 | 1,131 | 1,588 | 1,083 | 1,159 | 1,067 | 1,302 | 1,051 |
| 40 | 3,896 | 1,274 | 1,670 | 1,139 | 1,253 | 1,153 | 1,366 | 1,103 |
| 45 | 4,373 | 1,430 | 1,712 | 1,167 | 1,442 | 1,327 | 1,412 | 1,139 |
| 50 | 4,759 | 1,556 | 1,737 | 1,185 | 1,736 | 1,598 | 1,437 | 1,160 |
| 55 | 4,883 | 1,597 | 1,755 | 1,197 | 1,812 | 1,668 | 1,456 | 1,175 |

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Probabilities of Death of Active Contributors

| <u>Age</u> | <u>Males</u> | | <u>Females</u> | |
|------------|-----------------|--------------------|-----------------|--------------------|
| | <u>Officers</u> | <u>Other Ranks</u> | <u>Officers</u> | <u>Other Ranks</u> |
| 15 | .00077 | .00047 | .00024 | .00024 |
| 16 | .00088 | .00049 | .00026 | .00025 |
| 17 | .00099 | .00057 | .00028 | .00027 |
| 18 | .00110 | .00088 | .00029 | .00028 |
| 19 | .00123 | .00156 | .00031 | .00028 |
| 20 | .00136 | .00217 | .00032 | .00029 |
| 21 | .00150 | .00242 | .00034 | .00030 |
| 22 | .00165 | .00241 | .00036 | .00031 |
| 23 | .00181 | .00232 | .00037 | .00033 |
| 24 | .00197 | .00219 | .00039 | .00035 |
| 25 | .00211 | .00206 | .00041 | .00038 |
| 26 | .00221 | .00193 | .00043 | .00040 |
| 27 | .00227 | .00183 | .00045 | .00043 |
| 28 | .00220 | .00174 | .00048 | .00046 |
| 29 | .00215 | .00167 | .00052 | .00049 |
| 30 | .00204 | .00164 | .00055 | .00052 |
| 31 | .00191 | .00164 | .00059 | .00056 |
| 32 | .00181 | .00167 | .00064 | .00060 |
| 33 | .00175 | .00172 | .00069 | .00065 |
| 34 | .00173 | .00180 | .00074 | .00070 |
| 35 | .00172 | .00189 | .00080 | .00075 |
| 36 | .00173 | .00200 | .00086 | .00081 |
| 37 | .00176 | .00210 | .00092 | .00088 |
| 38 | .00184 | .00221 | .00100 | .00095 |
| 39 | .00194 | .00235 | .00108 | .00103 |
| 40 | .00209 | .00248 | .00116 | .00112 |
| 41 | .00229 | .00267 | .00126 | .00121 |
| 42 | .00253 | .00289 | .00136 | .00132 |
| 43 | .00281 | .00316 | .00148 | .00144 |
| 44 | .00313 | .00348 | .00161 | .00157 |
| 45 | .00351 | .00384 | .00175 | .00172 |
| 46 | .00392 | .00424 | .00191 | .00188 |
| 47 | .00438 | .00464 | .00208 | .00206 |
| 48 | .00488 | .00508 | .00227 | .00225 |
| 49 | .00542 | .00556 | .00248 | .00247 |
| 50 | .00602 | .00610 | .00270 | .00270 |
| 51 | .00666 | .00670 | .00294 | .00294 |
| 52 | .00736 | .00736 | .00319 | .00319 |
| 53 | .00808 | .00808 | .00346 | .00346 |
| 54 | .00885 | .00885 | .00377 | .00377 |
| 55 | .00970 | .00970 | .00410 | .00410 |

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Probabilities of Death of Contributors
retired for reasons other than disability
and
Annuity Values based thereon

| <u>Age</u> | <u>Probability of Death</u> | | |
|------------|-----------------------------|--------------------|--|
| | <u>Male Pensioners</u> | | <u>Female Pensioners (Present and Prospective)</u> |
| | <u>Present</u> | <u>Prospective</u> | |
| 30 | .00100 | .00089 | .00060 |
| 40 | .00203 | .00179 | .00120 |
| 50 | .00656 | .00578 | .00274 |
| 60 | .01566 | .01383 | .00662 |
| 70 | .03509 | .03199 | .01911 |
| 80 | .08550 | .08141 | .05847 |
| 90 | .20849 | .20721 | .17502 |

Value of Annuity of \$1.00 per annum
(interest at 4% per annum)

| <u>Age</u> | <u>Male Pensioners</u> | | <u>Female Pensioners (Present and Prospective)</u> |
|------------|------------------------|--------------------|--|
| | <u>Present</u> | <u>Prospective</u> | |
| | 30 | \$20.374 | \$20.580 |
| 40 | 18.232 | 18.502 | 19.755 |
| 50 | 15.456 | 15.782 | 17.386 |
| 60 | 12.331 | 12.648 | 14.267 |
| 70 | 8.909 | 9.138 | 10.480 |
| 80 | 5.614 | 5.715 | 6.565 |
| 90 | 3.037 | 3.044 | 3.382 |

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Probabilities of Death of Contributors
retired because of disability
and
Annuity Values based thereon

Probability of Death

| <u>Age</u> | <u>Male Pensioners</u> | <u>Female Pensioners</u> |
|------------|------------------------|--------------------------|
| 30 | .00945 | .00645 |
| 40 | .01312 | .01028 |
| 50 | .02559 | .01680 |
| 60 | .04142 | .02616 |
| 70 | .04435 | .03308 |
| 80 | .10846 | .09222 |
| 90 | .23667 | .22183 |

Value of Annuity of \$1.00 per annum
(interest at 4% per annum)

| <u>Age</u> | <u>Male Pensioners</u> | <u>Female Pensioners</u> |
|------------|------------------------|--------------------------|
| 30 | \$16.734 | \$18.033 |
| 40 | 14.524 | 16.079 |
| 50 | 12.152 | 13.956 |
| 60 | 10.222 | 11.629 |
| 70 | 8.027 | 8.793 |
| 80 | 4.948 | 5.351 |
| 90 | 2.814 | 2.931 |

Remarriage and Mortality Rates of Widows

| <u>Age at Widowhood</u> | <u>Remarriage Rates</u> | | | | <u>Attained Age</u> | <u>Mortality Rates</u> |
|-----------------------------|--------------------------|----------------|-----------------|-----------------|-------------------------|----------------------------|
| | <u>Year of Widowhood</u> | | | | | |
| | <u>1st yr.</u> | <u>5th yr.</u> | <u>10th yr.</u> | <u>Ultimate</u> | | |
| 25 | .0599 | .1004 | .0407 | .0123 | 39 | .0011 |
| 30 | .0317 | .0628 | .0190 | .0080 | 44 | .0016 |
| 35 | .0203 | .0351 | .0113 | .0042 | 49 | .0025 |
| 40 | .0110 | .0176 | .0073 | .0020 | 54 | .0038 |
| 45 | .0059 | .0082 | .0041 | .0013 | 59 | .0060 |
| 50 | .0026 | .0039 | .0013 | .0011 | 64 | .0100 |
| 55 | .0011 | .0013 | .0011 | .0004 | 69 | .0171 |
| | | | | | 74 | .0298 |
| | | | | | 79 | .0523 |
| | | | | | 84 | .0913 |
| | | | | | 89 | .1575 |

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>5th yr.</u> | <u>10th yr.</u> | <u>Ultimate</u> | |
| 25 | \$10.375 | \$13.416 | \$17.036 | \$18.371 | 39 |
| 30 | 13.649 | 15.966 | 17.966 | 18.034 | 44 |
| 35 | 15.934 | 17.285 | 17.842 | 17.242 | 49 |
| 40 | 17.167 | 17.529 | 17.109 | 16.024 | 54 |
| 45 | 17.422 | 17.018 | 15.972 | 14.497 | 59 |
| 50 | 16.881 | 15.971 | 14.497 | 12.758 | 64 |
| 55 | 15.743 | 14.497 | 12.758 | 10.871 | 69 |
| | | | | 8.884 | 74 |
| | | | | 6.938 | 79 |
| | | | | 5.156 | 84 |
| | | | | 3.645 | 89 |

Probabilities of Retirement of Active Contributors to
pension or gratuity for reasons other than disability

| <u>Age</u> | <u>Males</u> | | <u>Females</u> | |
|------------|-----------------|--------------------|-----------------|--------------------|
| | <u>Officers</u> | <u>Other Ranks</u> | <u>Officers</u> | <u>Other Ranks</u> |
| 15 | .0007 | .0013 | .0007 | .0013 |
| 16 | .0008 | .0013 | .0008 | .0014 |
| 17 | .0009 | .0013 | .0009 | .0014 |
| 18 | .0010 | .0013 | .0010 | .0015 |
| 19 | .0010 | .0013 | .0010 | .0015 |
| 20 | .0011 | .0013 | .0011 | .0016 |
| 21 | .0012 | .0013 | .0012 | .0016 |
| 22 | .0013 | .0013 | .0013 | .0016 |
| 23 | .0014 | .0013 | .0014 | .0017 |
| 24 | .0015 | .0013 | .0015 | .0017 |
| 25 | .0016 | .0013 | .0016 | .0018 |
| 26 | .0016 | .0013 | .0016 | .0019 |
| 27 | .0017 | .0013 | .0017 | .0020 |
| 28 | .0018 | .0013 | .0018 | .0021 |
| 29 | .0019 | .0013 | .0019 | .0023 |
| 30 | .0020 | .0013 | .0020 | .0024 |
| 31 | .0021 | .0013 | .0021 | .0025 |
| 32 | .0022 | .0014 | .0022 | .0026 |
| 33 | .0023 | .0015 | .0023 | .0028 |
| 34 | .0024 | .0016 | .0024 | .0030 |
| 35 | .0025 | .0018 | .0025 | .0032 |
| 36 | .0026 | .0020 | .0026 | .0034 |
| 37 | .0028 | .0022 | .0028 | .0037 |
| 38 | .0030 | .0024 | .0030 | .0040 |
| 39 | .0032 | .0026 | .0032 | .0043 |
| 40 | .0035 | .0029 | .0035 | .0047 |
| 41 | .0038 | .0032 | .0038 | .0051 |
| 42 | .0042 | .0036 | .0042 | .0056 |
| 43 | .0047 | .0040 | .0047 | .0061 |
| 44 | .0052 | .0045 | .0052 | .0066 |
| 45 | .1000 | .0050 | .1000 | .0072 |
| 46 | .1000 | .0057 | .1000 | .0078 |
| 47 | .2000 | .0066 | .2000 | .0084 |
| 48 | .2000 | .0075 | .2000 | .0091 |
| 49 | .4000 | .0086 | .4000 | .0100 |
| 50 | .4000 | .7000 | .4000 | .7000 |
| 51 | .5000 | .6000 | .5000 | .6000 |
| 52 | .5000 | .5000 | .5000 | .5000 |
| 53 | .5000 | .5000 | .5000 | .5000 |
| 54 | .5000 | .5000 | .5000 | .5000 |
| 55 | .9855 | .9694 | .9823 | .9823 |

Probabilities of Retirement of Active
Contributors because of disability

| <u>Age</u> | <u>Males</u> | | <u>Females</u> | |
|------------|-----------------|--------------------|-----------------|--------------------|
| | <u>Officers</u> | <u>Other Ranks</u> | <u>Officers</u> | <u>Other Ranks</u> |
| 15 | .0006 | .0000 | .0012 | .0000 |
| 16 | .0006 | .0000 | .0012 | .0000 |
| 17 | .0006 | .0005 | .0013 | .0005 |
| 18 | .0006 | .0032 | .0013 | .0022 |
| 19 | .0006 | .0062 | .0014 | .0039 |
| 20 | .0006 | .0071 | .0015 | .0048 |
| 21 | .0007 | .0076 | .0015 | .0054 |
| 22 | .0007 | .0078 | .0016 | .0057 |
| 23 | .0007 | .0079 | .0017 | .0058 |
| 24 | .0007 | .0079 | .0018 | .0056 |
| 25 | .0008 | .0077 | .0019 | .0053 |
| 26 | .0008 | .0073 | .0020 | .0049 |
| 27 | .0008 | .0069 | .0021 | .0041 |
| 28 | .0008 | .0065 | .0022 | .0035 |
| 29 | .0009 | .0061 | .0023 | .0032 |
| 30 | .0009 | .0058 | .0024 | .0031 |
| 31 | .0009 | .0056 | .0026 | .0030 |
| 32 | .0010 | .0054 | .0027 | .0031 |
| 33 | .0011 | .0053 | .0029 | .0031 |
| 34 | .0011 | .0052 | .0031 | .0032 |
| 35 | .0012 | .0053 | .0033 | .0034 |
| 36 | .0012 | .0053 | .0035 | .0035 |
| 37 | .0013 | .0055 | .0037 | .0037 |
| 38 | .0014 | .0057 | .0039 | .0039 |
| 39 | .0015 | .0060 | .0041 | .0041 |
| 40 | .0016 | .0064 | .0044 | .0044 |
| 41 | .0018 | .0069 | .0047 | .0047 |
| 42 | .0019 | .0075 | .0050 | .0050 |
| 43 | .0021 | .0081 | .0054 | .0054 |
| 44 | .0022 | .0088 | .0058 | .0058 |
| 45 | .0024 | .0096 | .0062 | .0062 |
| 46 | .0026 | .0104 | .0067 | .0067 |
| 47 | .0028 | .0114 | .0073 | .0073 |
| 48 | .0031 | .0126 | .0079 | .0079 |
| 49 | .0033 | .0140 | .0085 | .0085 |
| 50 | .0035 | .0155 | .0092 | .0092 |
| 51 | .0038 | .0169 | .0100 | .0100 |
| 52 | .0040 | .0181 | .0108 | .0108 |
| 53 | .0043 | .0191 | .0117 | .0117 |
| 54 | .0045 | .0201 | .0126 | .0126 |
| 55 | .0048 | .0209 | .0136 | .0136 |

Probabilities of Termination of Service of
Active Contributors with refund of contributions

| <u>Age</u> | <u>Males</u> | | <u>Females</u> | |
|------------|-----------------|--------------------|-----------------|--------------------|
| | <u>Officers</u> | <u>Other Ranks</u> | <u>Officers</u> | <u>Other Ranks</u> |
| 15 | .0120 | .0375 | .0120 | .0405 |
| 16 | .0155 | .0475 | .0155 | .0570 |
| 17 | .0275 | .0610 | .0220 | .0835 |
| 18 | .0460 | .0799 | .0295 | .1205 |
| 19 | .0690 | .1015 | .0395 | .1980 |
| 20 | .0900 | .1225 | .0510 | .2720 |
| 21 | .0785 | .1410 | .0650 | .2975 |
| 22 | .0605 | .1525 | .0825 | .3075 |
| 23 | .0420 | .1545 | .1045 | .3080 |
| 24 | .0290 | .1475 | .1275 | .3020 |
| 25 | .0215 | .1355 | .1495 | .2945 |
| 26 | .0165 | .1205 | .1640 | .2860 |
| 27 | .0135 | .1060 | .1700 | .2765 |
| 28 | .0115 | .0930 | .1670 | .2660 |
| 29 | .0100 | .0810 | .1580 | .2550 |
| 30 | .0095 | .0715 | .1440 | .2430 |
| 31 | .0090 | .0635 | .1275 | .2310 |
| 32 | .0090 | .0580 | .1110 | .2185 |
| 33 | .0090 | .0530 | .0975 | .2065 |
| 34 | .0085 | .0495 | .0870 | .1945 |
| 35 | .0085 | .0470 | .0780 | .1825 |
| 36 | .0085 | .0450 | .0705 | .1705 |
| 37 | .0085 | .0435 | .0630 | .1580 |
| 38 | .0085 | .0425 | .0565 | .1460 |
| 39 | .0085 | .0415 | .0510 | .1335 |
| 40 | .0085 | .0400 | .0460 | .1215 |
| 41 | .0085 | .0385 | .0410 | .1090 |
| 42 | .0085 | .0370 | .0360 | .0965 |
| 43 | .0080 | .0340 | .0315 | .0840 |
| 44 | .0075 | .0310 | .0270 | .0720 |
| 45 | .0070 | .0275 | .0225 | .0600 |
| 46 | .0060 | .0230 | .0180 | .0480 |
| 47 | .0050 | .0180 | .0135 | .0350 |
| 48 | .0035 | .0125 | .0090 | .0230 |
| 49 | .0015 | .0060 | .0040 | .0120 |
| 50 | .0000 | .0000 | .0000 | .0000 |

B10

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" pension
of contributors at death

| <u>Age of Contributor at death</u> | <u>Proportion of Contributors married at death</u> | | | <u>Average age of Widows</u> | <u>Value of Children's Benefits</u> |
|------------------------------------|--|-------------------------|-------------------|------------------------------|-------------------------------------|
| | <u>Active Contributors</u> | | <u>Pensioners</u> | | |
| | <u>Officers</u> % | <u>Other Ranks</u> % | % | | |
| 25 | 63.6 | 38.0 | 53.4 | 24.5 | \$1.87 |
| 30 | 83.6 | 67.6 | 77.2 | 28.8 | 1.81 |
| 35 | 92.2 | 81.0 | 87.7 | 33.1 | 1.68 |
| 40 | 96.6 | 88.7 | 93.4 | 37.4 | 1.44 |
| 45 | 98.4 | 93.0 | 96.2 | 41.7 | 1.03 |
| 50 | 98.0 | 94.7 | 96.7 | 46.0 | 0.56 |
| 55 | 95.9 | 94.0 | 95.1 | 50.4 | 0.30 |
| 60 | | | 91.7 | 54.8 | 0.15 |
| 65 | | | 86.5 | 59.3 | 0.06 |
| 70 | | | 79.7 | 63.8 | 0.02 |
| 75 | | | 70.6 | 68.3 | |
| 80 | | | 59.5 | 72.9 | |
| 85 | | | 46.3 | 77.4 | |
| 90 | | | 31.2 | 81.9 | |

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B11

Capitalized Values of Pension Benefits
per \$1.00 "earned" pension of contributors at retirement or death
(interest at 4% per annum)

On Retirement to Pension for reasons other than disability

| <u>Age of Contributor at Retirement</u> | <u>Males</u> | | <u>Females (Officers and Other Ranks)</u> |
|---|-----------------|--------------------|---|
| | <u>Officers</u> | <u>Other Ranks</u> | |
| 25 | \$22.242 | \$22.216 | \$22.169 |
| 30 | 21.602 | 21.577 | 21.505 |
| 35 | 20.832 | 20.808 | 20.719 |
| 40 | 19.911 | 19.889 | 19.793 |
| 45 | 18.821 | 18.802 | 18.707 |
| 50 | 17.577 | 17.562 | 17.448 |
| 55 | 16.181 | 16.172 | 16.003 |

On Retirement to Pension because of disability

| <u>Age of Contributor at Retirement</u> | <u>Males</u> | | <u>Females (Officers and Other Ranks)</u> |
|---|-----------------|--------------------|---|
| | <u>Officers</u> | <u>Other Ranks</u> | |
| 25 | \$19.830 | \$19.647 | \$18.860 |
| 30 | 19.351 | 19.204 | 18.035 |
| 35 | 18.624 | 18.504 | 17.094 |
| 40 | 17.698 | 17.601 | 16.084 |
| 45 | 16.643 | 16.573 | 15.033 |
| 50 | 15.518 | 15.473 | 13.966 |
| 55 | 14.354 | 14.332 | 12.834 |

On Death leaving dependents eligible for pension

| <u>Age of Contributor at Death</u> | <u>Active Contributors (Male Officers and Male Other Ranks)</u> | <u>Retired Contributors (Males)</u> |
|------------------------------------|---|-------------------------------------|
| 25 | \$6.871 | \$6.854 |
| 30 | 8.313 | 8.297 |
| 35 | 9.299 | 9.282 |
| 40 | 9.789 | 9.770 |
| 45 | 9.719 | 9.698 |
| 50 | 9.271 | 9.246 |
| 55 | 8.732 | 8.702 |
| 60 | | 8.045 |
| 65 | | 7.307 |
| 70 | | 6.461 |
| 75 | | 5.573 |
| 80 | | 4.671 |
| 85 | | 3.777 |
| 90 | | 2.932 |

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