840282

TEACHERS RETIREMENT ASSOCIATION

STATE OF MINNESOTA

REPORT OF ACTUARIAL VALUATION AND EXPERIENCE STUDY

June 30, 1983

Pursuant to MS 356.215

Teachers Retirement Association
State of Minnesota

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PURPOSE

The purpose of this report is to set forth the financial status of the Teachers Retirement Fund as of June 30, 1983 in accordance with the provisions of Minnesota Statutes, Section 356.215.

This section requires that an actuarial valuation of the fund be made each year. Such valuation shall be based on an assumed interest rate of 5% and an assumed salary increase rate of 3.5%. The valuation report shall set forth the following items based on these assumptions and such other assumptions as may be appropriate:

1. The normal cost of the benefits provided by the laws governing the fund computed in accordance with the entry age normal cost method and expressed as a level percentage of the future payroll of active participants of the fund.

2. The accrued liabilities of the fund defined as the present value of all benefits minus the present value of future entry age normal costs.

3. An actuarial balance sheet showing accrued assets, accrued liabilities, and the deficit from full funding of liabilities (unfunded accrued liability).

4. The additional annual contribution which would be required in addition to the normal cost to retire the unfunded accrued liability on a level dollar basis by the established date for full funding which is in effect at the time of the valuation.

5. An analysis explaining the increase or decrease in the unfunded accrued liability since the last valuation.

6. A statement of the administrative expenses in dollars and also as a percentage of covered payroll.

7. A summary of the principal provisions of the plan upon which the valuation is based.

This report is intended to comply with the requirements of Section 356.215.

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PRINCIPAL VALUATION RESULTS

The principal results of our valuation are summarized and compared with those of June 30, 1982 in the following schedule:

SUMMARY OF PRINCIPAL VALUATION RESULTS

	1982	1983
1. Normal Cost		
a. Basic Group	16.00%	15.92%
b. Coordinated Group	9.06%	9.06
2. Accrued Liability	$3,108,085,664	$3,472,264,036
3. Valuation Assets in Excess of Current Liabilities	$1,710,750,595	$1,983,579,211
4. Unfunded Accrued Liability	$1,397,335,069	$1,488,684,825
5. Funding Ratio	55.04%	57.13%
6. Additional Contribution to Amortize Unfunded Liability by 2009	$ 95,426,611	$ 103,559,349
7. Current Payroll	$1,129,420,339	$1,146,613,563
8. Additional Contribution Rate	8.45%	9.03%
9. Administrative Expenses	$ 1,318,952	$ 1,466,044
10. Administrative Expenses as percentage of current payroll	0.12%	0.13%

NORMAL COST

The normal cost for the basic group decreased from 16.00% to 15.92% and for the coordinated group remained unchanged at 9.06%. Current statutes provide for equal employer and employee contributions of 8.5% of salary for the basic group and 4.5% for the coordinated group. The normal cost rates were determined using the entry age normal cost method.

ACTUARIAL BALANCE SHEET

The following sets forth the actuarial balance sheet of the fund as of June 30, 1982 and June 30, 1983:

	6-30-82	6-30-83
Accrued Liability	$3,108,085,664	$3,472,264,036
Available Assets	1,710,750,595	1,983,579,211
Unfunded Accrued Liability	$1,397,335,069	$1,488,684,825
Funding Ratio	55.04%	57.13%

The accrued actuarial liability of the fund is summarized in Table 1. The liability increased during the year by $364,178,372 or 11.7%.

The assets available for funding the accrued liability are summarized in Table 2. These assets increased during the year by $272,828,616 or 15.9%.

The unfunded accrued liability is the excess of the accrued liability over the available assets. The unfunded liability increased during the year by $91,349,756, or 6.5%. An analysis explaining this increase is presented on page 7 of this report.

The funding ratio is the ratio of the available assets to the accrued liability. This ratio increased during the year from 55.04% to 57.13%.

ADDITIONAL SUPPORT RATE

In addition to the normal cost contribution discussed above, an employer contribution of 3.05% of salary is provided by statute to amortize the unfunded accrued liability. The additional contribution needed to amortize this deficit by June 30, 2009 has been determined as follows:

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		6-30-82	6-30-83
(a)	Unfunded Accrued Liability	$1,397,335,069	$1,488,684,825
(b)	Annual Cost to Amortize by 2009	95,426,611	103,559,349
(c)	Current Annual Payroll	1,129,420,339	1,146,613,563
(d)	Additional Support Rate (b)/(c)	8.45%	9.03%

Interest at the rate of 5% on the current unfunded accrued liability amounts to $74,434,241 or 6.49% of the current annual payroll.

ADMINISTRATIVE EXPENSES

The cost of administration of the fund during the year amounted to $1,466,044. This represents 0.13% of the current annual payroll.

MEMBERSHIP DATA

The Executive Director furnished us with data pertaining to active members, inactive members and retired members. Tables 3, 4, and 5 summarize this data and the changes during the year for each of these groups.

SUMMARY OF PLAN PROVISIONS

1. Normal Retirement Benefit

   a. After attainment of age 65, or attainment of age 62 with 30 years service.

   b. Benefit based on average of highest consecutive 5 years earnings and years of service.

   c. Benefit percentages of average salary per year of service.

      Basic : 2.0% for first 10 years, 2.5% thereafter
      Coordinated: 1.0% for first 10 years, 1.5% thereafter

      (These percentages are reduced by one-half for each year of participation in the partial formula groups)

2. Late Retirement Benefit

   a. Annuitiy determined as for normal retirement considering service and earnings to actual retirement.

3. Early Retirement Benefit

a. After attainment of age 55 and completion of 10 years of service or after completion of 30 years of service.

b. Annuity determined as for normal retirement considering service and earnings to actual retirement and reduced by ½ of 1% for each month under age 65, to and including age 60, and by ¼ of 1% for each month under age 60.

c. After completion of 10 years service member may elect a deferred annuity to commence any time after attainment of age 55. The annuity is increased by compound interest from the date service terminated to the date annuity payments begin. Interest is at the rate of 3% after 1980.

4. Disability Benefit

a. After attainment of age 50 and completion of 5 years of service or after completion of 10 years of service.

b. Annuity determined as for normal retirement considering service and earnings to actual retirement with no reduction because of age.

c. Basic group members receive additional benefit based on their age at the time of retirement. This benefit is graded from $5 monthly for age 64 to $50 monthly for ages 55 and under.

5. Pre-Retirement Death Benefit

a. A refund of member's contributions with interest; or

b. After attainment of age 55 and completion of 20 years of service or after completion of 30 years service - the last half of a full joint and survivor annuity payable to a surviving spouse for life; or

c. For basic group members after completion of 18 months of service an annuity payable to a surviving dependent spouse equal to 30% of the members salary in the last year plus 10% for each dependent child subject to a family maximum of $700 per month.

6. Other Separation Benefits

a. A refund of member's contributions without interest.

ACTUARIAL METHODS AND ASSUMPTIONS

As required by Minnesota Statutes, Section 356.215, the entry age normal cost method has been used to determine the accrued liability for active participants. Under this method the entry age normal cost, expressed as a percentage of future annual earnings, is determined at the time of entry for each participant. This is done by dividing the present value of expected future benefits by the present value of expected future earnings. The accrued liability at any time after entry is defined as the present value of expected future benefits less the entry age normal cost percentage of expected future earnings.

The assumption used in making this valuation are shown in Table 6.

There have been no changes in the methods or assumptions since the previous actuarial valuation.

POST-RETIREMENT INVESTMENT FUND

The post-retirement investment fund (PRIF) is a vehicle for providing variable annuity payments to retired participants. When a participant retires, assets equal to the present value of future benefits expected to be paid to that participant are transferred from the basic fund to the PRIF. Thereafter, benefits are paid from the PRIF. If interest earned by the PRIF exceeds the assumed valuation rate of 5% benefit payments are increased.

The PRIF participation, shown as an asset in Table 2, is equal to the present value of all benefits being paid from that fund as of the valuation date. As of June 30, 1983 the participation shown exceeded the teachers retirement fund's share of the PRIF assets by $14,067,430. This amount is referred to as the annuity stabilization reserve.

During the year TRA annuitants receiving benefits from PRIF experienced less mortality than expected resulating in an actuarial loss of $934,374. This amount will be paid from TRA to PRIF.

As of January 1, 1983 benefits being paid from PRIF which had commenced before July 1, 1981 were increased by 6.85%. The cost of this increase is provided from earnings on investments of PRIF in excess of the 5% statutory valuation assumption.

ANALYSIS OF CHANGE IN UNFUNDED ACCRUED LIABILITY

During the current year the unfunded accrued liability increased by $91,349,756. The causes of this increase may be summarized as follows:

Increases:	
Actuarial Loss - salary increases	$216,437,411
Contribution deficiency	56,977,565
Post-Retirement mortality	934,374
Decreases:	
Actuarial gains	
Investment income	73,873,245
Pre-retirement terminations and benefits	109,126,349
Net Increase	$ 91,349,756

As required by Section 356.215 Subd. 4, in calculating the accrued prior service liability it is assumed that salaries increase each year at a rate of 3.5%. In the past year salaries actually increased at a rate of 13.5%. This departure from the assumed rate increased the deficit by $216,437,411.

For purposes of this report it is assumed that minimum contributions are the sum of the entry age normal cost, 5% interest on the unfunded liability at the beginning of the year, and administrative expenses. Actual employee and employer contributions were $56,977,565 less than this required amount.

Annuitants receiving benefits from the Post-Retirement Investment Fund experienced mortality less favorable than expected resulting in an actuarial loss of $934,374.

In computing required reserves it is assumed that investment income would be earned at the rate of 5% per annum. The actual income from investments exceeded the income required to maintain reserves on this basis by $73,873,245.

Members terminated service prior to retirement at a rate greater than expected, releasing required reserves. This resulted in an actuarial gain of $109,126,350.

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REPORT OF EXPERIENCE STUDY 1979-1983

The following table compares the actuarial balance sheet at the beginning and end of the period covered by this experience study report:

	6-30-79	6-30-83	Increase
Accrued Liability	$2,080,173,976	$3,472,264,036	$1,392,090,060
Assets	1,064,237,842	1,983,579,211	919,341,369
Unfunded Liability	$1,015,936,134	$1,488,684,825	$ 472,748,691
Funding Ratio	51.16%	57.13%	

In the valuation report for each of the past four years the causes of the increase in unfunded liabilities, or the deficit, are discussed. These may be summarized as follows:

Increases:		
Actuarial loss - salaries	$725,569,577	
Deficiency in employer contributions	125,601,723	
Actuarial loss - PRIF mortality	228,494	
Total		$851,399,794
Decreases:		
Actuarial gain - investment income	$213,959,941	
Actuarial gain - termination	162,252,708	
Asset Adjustment	2,438,454	
Total Decreases		$378,651,103
Net Increase		$472,748,691

Post-Retirement Mortality. Effective June 30, 1979 the Fund adopted the 1971 Group Annuity Mortality Table for males set back eight years as a mortality assumption for both males and females. Over the four years covered by this study there were 847 deaths of service retirement annuitants, whereas, 862 deaths were expected according to the assumed mortality basis. The ratio of actual to expected deaths was 98.2%.

Rate of Salary Increase. In calculating prior service liabilities it is assumed that salaries increase at the rate of 3.5% a year. At June 30, 1983 the average salary was $19,827 compared with $13,984 four years earlier. This represents an average annual increase rate of 9.12%.

Rate of Return on Investments. The rate of investment earnings on the mean assets of the Fund, excluding participation in the Post Retirement Investment Fund and the Variable Annuity Fund in each of the last four years has been:

1979-80	1980-81	1981-82	1982-83
9.51%	12.88%	9.90%	11.84%

A rate of 5% is assumed in calculating liabilities.

Average Age at Entry. The average age at entry for all members currently active under a formula plan is 26.9 years. The average in each of the last four years has been:

1979-80	1980-81	1981-82	1982-83
27.1	27.2	27.4	27.8

No average age at entry is assumed in calculating liabilities.

Average Age at Retirement. The average age at which service retirements have taken place for all current annuitants is 62.1 years. The average in each of the last four years has been:

1979-80	1980-81	1981-82	1982-83
61.4	61.7	61.2	61.3

Retirement at age 62 is assumed in calculating prior service liabilities.

Pre-Retirement Separations. Effective June 30, 1978 the Fund adopted the assumed rates of pre-retirement termination of active participants as shown in Table 6 of the valuation report. The following table shows a comparison of the actual separations during the four year period with the expected separations according to the assumed rates:

	Number of Separations		Ratio Actual To
Cause of Separation	Actual	Expected	Expected
Death in service	368	322	114%
Disability retirement	180	306	59
Other withdrawals	29,525	17,488	169
Total	30,073	18,116	166%

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TABLE 1

SUMMARY OF ACCRUED LIABILITY

1.	Post-Retirement Investment Fund Participation		$ 673,363,552.14
2.	Variable Annuity Fund Participation		$ 96,330,577.09
3.	For Active Members		
	Basic - Full formula	$ 383,276,781	
	Basic - Former partial formula	116,398,292	
	Basic - Partial formula	555,348	
	Coordinated - Full formula	1,489,895,847	
	Coordinated - Former partial formula	583,733,943	
	Coordinated - Partial formula	4,511,097	
	Total		$2,578,371,308.00
4.	For Inactive Members		
	Basic - Full formula	$ 23,114,853	
	Basic - Partial formula	2,774,344	
	Coordinated - Full formula	56,817,756	
	Coordinated - Partial formula	16,421,364	
	Total		$ 99,128,317.00
5.	1915 Law Annuities		$ 50,760.49
6.	Disability Annuities		$ 20,704,222.98
7.	Surviving Spouse Annuities		$ 4,252,368.79
8.	Surviving Children Annuities		$ 62,929.62
	Total Accrued Liability		$3,472,264,036.11

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Table 2

ASSETS AND CURRENT LIABILITIES

Assets	
Cash	$ 908,422.06
Accounts receivable	26,411,118.96
Due from other funds	375,009.69
Accrued investment income	12,194,286.39
Investment at amortized cost*	1,110,214,237.38
Short-term cash equivalents	45,886,872.00
Equity in Investment Funds	769,640,183.45
Deferred yield adjustment account	24,470,048.74
Equipment at cost, less depreciation	43,611.97
Total Assets	$1,990,143,790.64
B. Current Liabilities	
Accounts payable	$ 5,357,414.24
Due to other funds	1,150,636.07
Accrued Compensated absences	56,529.08
Total current liabilities	$ 6,564,579.39
C. Assets in excess of current liabilities	$1,983,579,211.25

* The market value of these investments as of June 30, 1983 was $1,217,905,734.74.

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TABLE 3

SUMMARY OF CENSUS OF ACTIVE MEMBERS

	Basic Group		Coordinated Group	
	Number	Annual Payroll	Number	Annual Payroll
Full Formula				
At 6-30-82	2,073	$51,850,870	50,446	$802,660,659
New Entrants	17		5,094	
To Inactive	0		(3,964)	
Separation with Refund	(8)		(5,423)	
Deaths	(8)		(95)	
Disability	(9)		(38)	
Service Retirement	(240)		(542)	
At 6-30-83	1,825	$49,602,118	45,478	$810,727,629
Former Partial Formula				
At 6-30-82	622	$17,305,665	10,316	$254,896,350
New Entrants	6		0	
To Inactive	0		(224)	
Separation with Refund	(2)		(193)	
Deaths	(4)		(15)	
Disability Retirement	0		0	
Service Retirement	(14)		(75)	
At 6-30-83	608	$18,076,472	9,809	$265,395,019
Partial Formula				
6-30-82	4	$ 118,699	112	$ 2,588,096
To Inactive	(1)		(4)	
At 6-30-83	3	$ 90,968	108	$ 2,721,357
Total at 6-30-82	2,699	$69,275,234	60,874	$1,060,145,105
Total at 6-30-83	2,436	$67,769,558	55,395	$1,078,844,005

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TABLE 4

SUMMARY OF CENSUS OF INACTIVE MEMBERS

	Basic Group		Coordinated Group	
	Number	Projected Annuity	Number	Projected Annuity
Full Formula				
At 6-30-82	497	$1,834,266	13,046	$7,587,767
Reinstated	28		0	
From Active	0		3,964	
Separation with Refund	(1)		(212)	
Deaths	(2)		(24)	
Service Retirement	(22)		(20)	
Write-offs	(1)		(1,486)	
6-30-83	499	$2,349,282	15,268	$9,971,711
Partial Formula				
At 6-30-82	32	$ 339,913	836	$1,954,301
Reinstated	2		0	
From Active	1		228	
Separation with Refund	0		(12)	
Deaths	0		(2)	
Service Retirement	(4)		0	
Write-offs	0		(6)	
At 6-30-83	31	$ 335,412	1,044	$2,849,168
Total at 6-30-82	529	$2,174,179	13,882	$ 9,542,068
Total at 6-30-83	530	$2,684,694	16,312	$12,820,879

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TABLE 5

SUMMARY OF CENSUS OF ANNUITANTS

e of Annuity	Number	Annual Amount	Present Value
ities Payable from Post Retirement Investment Fund			
Service Retirement Annuitants			
as of 6-30-82	10,342	$46,922,644.64	$536,694,138.81
new	923	7,061,954.58	
deaths	−220	− 692,108.52	
net adjustments	109	3,404,544.60	
as of 6-30-83	11,154	$56,697,035.30	$647,539,568.87
Beneficiaries of Deceased Members			
as of 6-30-82	121	$ 610,722.04	$ 6,971,260.59
new	13	115,476.12	
expired	− 7	− 23,119.68	
net adjustments	0	28,634.64	
as of 6-30-83	127	$ 731,763.12	$ 8,602,641.44
Beneficiaries of Deceased Annuitants			
as of 6-30-82	427	$ 1,795,341.12	$ 10,175,811.75
new	64	304,668.60	
expired	− 47	− 165,127.32	
net adjustments	0	148,406.76	
as of 6-30-83	444	$ 2,083,289.16	$ 11,794,733.75
Section 136.82 Supplemental Annuities			
as of 6-30-82	161	$ 106,268.88	$ 1,170,318.37
new	10	14,745.36	
deaths	− 3	− 1,283.40	
net adjustments	0	6,022.32	
as of 6-30-83	168	$ 125,753.16	$ 1,369,394.79
Section 354.59 Allowances			
as of 6-30-82		$ 613,905.60	$ 4,174,842.88
expirations		28,767.72	
net adjustments		35,067.48	
as of 6-30-83		$ 620,205.36	$ 4,057,213.29
tal 6-30-82 MPRIF	11,051	$50,048,932.28	$559,186,372.40
tal 6-30-83 MPRIF	11,893	$60,258,046.10	$673,363,552.14

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TABLE 5 (Cont'd.)

SUMMARY OF CENSUS OF ANNUITANTS

Type of Annuity	Number	Annual Amount	Present Value
6. Service Retirement Annuities Payable from Variable Annuity Fund			
as of 6-30-82	154	$ 50,870.40	$ 671,369.23
new	38	17,425.68	
deaths	0	0	
net adjustments	1	25,774.20	
as of 6-30-83	193	$ 94,070.28	$ 1,219,507.43
7. Disability Annuities			
as of 6-30-82	214	$ 1,293,474.72	$ 18,167,074.05
new	49	402,968.68	
deaths	13	95,384.16	
returned to work	9	76,952.52	
net adjustments	(18)	(53,615.56)	
as of 6-30-83	223	$ 1,470,491.16	$ 20,704,222.98
8. Survivor Benefits			
as of 6-30-82	106	$ 282,676.44	$ 3,702,322.93
new	13	59,175.00	
terminated	10	21,301.80	
net adjustments	0	19,119.84	
as of 6-30-83	109	$ 339,669.48	$ 4,315,298.41
9. 1915 Law Annuities			
as of 6-30-82	10	$ 17,009.04	$ 68,674.64
deaths	1	1,649.64	
as of 6-30-83	9	$ 15,359.40	$ 59,173.45

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TABLE 6

ASSUMED RATES OF DECREMENT USED IN VALUATION OF FORMULA PLAN BENEFITS

Age	Death	Disability	Withdrawal
20	.000405	.000380	.177
25	.000457	.000500	.146
30	.000544	.000560	.116
35	.000684	.000645	.085
40	.000916	.000820	.055
45	.001295	.001105	.024
50	.002000	.001735	.001
55	.003754	.003560	.001
60	.006480	.006320	.001

Assumed age at retirement -62

Post Retirement Mortality - 1971 Group Annuity Mortality Table for males set back 8 years.

Assumed rate of interest - 5%

Assumed rate of salary increase - 3.5%

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November 21, 1983

Board of Trustees
State of Minnesota
Teachers Retirement Association
St. Paul, Minneosta 55101

Re: Supplement to Report of Actuarial Valuation

Gentlemen:

The Report of Actuarial Valuation which we have submitted was prepared in accordance with the provisions of Minnesota Statutes, Chapter 356. This chapter includes specific requirements relating to asset valuation, actuarial cost method, and actuarial assumptions. The purpose of this supplement to the report is to present alternatives to these specifications. A projection of the cash flow of the fund over the next 20 years is also presented.

ASSET VALUATION

Chapter 356 requires that assets include investment in bonds at amortized cost and investment in stocks at cost. As of June 30, 1983 the market value of these investments was $107,691,497 more than the value shown in our report.

Chapter 356 also requires including a deferred yield adjustment account. This account is not a marketable asset but represents unamortized losses realized by the disposition of bonds at a value less than the amortized cost. As of June 30, 1983 this account amounted to $24,470,049.

The amount of $672,429,178 is shown as an asset representing participation in the Post-Retirement Investment Fund. This amount is the required reserve for annuities being paid from that fund. This amount exceeds the teachers retirement fund share in the book value of PRIF assets by $14,067,430. We do not know the extent to which the book value exceeds the market value.

ACTUARIAL COST METHOD

Chapter 356 requires the use of the entry age normal method for determination of required reserves for active participants. This is only one of several acceptable actuarial cost methods. It is generally considered to be the most conservative and produces the greatest required reserve.

For several years we have also calculated the accrued liability for active participants using an accrued benefit cost method. There are several different versions of an accrued benefit cost method. The method we have used assumes a liability for participants with less than 10 years of service equal to their contributions without interest. For other participants we calculate the value of the annuity to which they would be entitled at age 62, based on their years of service to date and their average salary over the last 5 years. This value is discounted at 5% interest to the valuation date.

As of June 30, 1982 the accrued liability for active participants calculated using this method was $1,484,906,620. This amount is $1,093,464,688 or 42.4% less than the accrued liability for these participants calculated using the entry age normal cost method.

We do not feel this method would be appropriate for TRA. These figures are presented only to show the range in accrued liability amounts between the most conservative and the least conservative method.

The statement on pension accounting and financial reporting for public employee retirement systems prepared by the National Council on Governmental Accounting was issued in June 1983. This would require all systems to report actuarial liabilities determined under the unit credit actuarial cost method, with benefits based upon projected salary increases. The liability of TRA determined under this method will be less than under the entry age normal method and greater than under the accrued benefit method we have been using.

It is important to note that the cost method used does not affect the ultimate cost of retirement benefits. Under any acceptable cost method reserves are accumulated at the time of retirement equal to the value of retirement benefits to be paid. The cost method determines the timing of the accumulation of that reserve. Under the entry age normal method funding is made as a uniform percentage of compensation each year. Under other methods the percentage increases each year until retirement.

ACTUARIAL ASSUMPTIONS

Chapter 356 requires the use of 5% interest and 3.5% salary increase rates for calculating actuarial liabilities. We have prepared the enclosed schedule to illustrate the effect changes in these assumed rates would have on the funding of TRA. We have prepared these for three different cases. In the first we have assumed no change in the post-retirement interest rate. In the second we have assumed the pre-retirement and post-retirement interest are both increased and that the surplus generated in the PRIF is not returned to reduce the unfunded liability. In the third we have assumed the surplus generated in the PRIF is returned to reduce the unfunded liability.

You will note that your present normal support rate plus the additional support rate required to amortize the deficit by the year 2009 amounts to 18.09%. If the assumed salary increase rate was increased from 3.5% to 6.5% and the assumed pre-retirement interest rate was increased from 5.0% to 8.0% the normal support rate plus the additional support rate would amount to 17.86%. If the difference between the assumed interest and salary increase rates remains constant any change in the level of such rates will not have a significant effect on your funding cost. If the difference between these rates were increased your funding cost would decrease and, conversely if the difference were decreased your funding cost would increase.

It is important to note that pre-retirement assumptions do not affect the ultimate cost of retirement benefits. They do affect the timing of the accumulation of the required reserve at the time of retirement. The post-retirement interest assumption does affect the cost of retirement benefits. An increase in this rate from 5% to 6.5% would reduce the cost of future retirement benefits by about 11%. This change would also reduce the required reserves for current annuities by about $75,000,000. This amount could be used to increase these annuities by about 13%

or to reduce the unfunded liability. Future post-retirement benefit increases would be reduced because of the reduction in the spread between actual and assumed rates of return on investments.

CASH FLOW PROJECTION

For several years we have noted in our reports on the actuarial valuation of TRA the inadequacy of contribution rates. The extent of this inadequacy is not immediately apparent especially in view of the strong positive cash flow. In 1983 your income from contributions and investments exceeded your outgo for transfers to PRIF, refunds, anciliary benefits and administrative expenses by a ratio of $2.25 income for each $1.00 outgo. There are several factors which could cause a rapid decrease in this ratio. These include falling interest rates, increasing retirements and a decrease in active membership.

To illustrate the possible future problem we have prepared the enclosed cash flow projection. In preparing this projection we have made the following assumptions:

1. The number of active teachers will decrease by 2% in each of the next 4 years and remain constant thereafter.

2. The rate at which active participants retire will increase by 1.04 per 1,000 each year. This is the actual rate of increase over the last 5 years.

3. The rate at which active participants receive a refund or anciliary benefit will remain constant.

4. Investment income will be earned at a rate of 10% in 1984 decreasing by 25 basis points each year thereafter.

5. Employee and employer contributions will not change.

6. The following will increase at an annual rate of 6%:

    Average salary
    Average retirement transfer to PRIF
    Average anciliary benefit
    Administrative expenses

From the enclosed schedule you will note that, based on the above assumptions the ratio of income to outgo will decrease each year and after 1999 outgo would exceed income.

Respectfully submitted

BROWN AND FLOTT

Robert F. Flott

Robert F. Flott

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Minnesota Teachers Retirement Association

Illustration of Variations in Assumed Rates of Interest and Salary Increase

Interest Rate	No Change in Post-Retirement Interest Assumption — Salary Increase Rate 3.5%	5.0%	6.5%	Post-Retirement Interest Rate Same as Pre-Retirement - No Return of Surplus Generated in PRIF — Salary Increase Rate 3.5%	5.0%	6.5%	Post-Retirement Interest Rate Same as Pre-Retirement-Surplus Generated in PRIF Returned to Basic Fund — Salary Increase Rate 3.5%	5.0%	6.5%
Normal Support Rate									
5.0%	9.06%	11.32%	14.18%	9.06%	11.32%	14.18%	9.06%	11.32%	14.18%
6.5	6.64	8.25	10.37	5.90	8.25	10.37	5.90	8.25	10.37
8.0	5.30	6.36	7.84	4.22	6.36	7.84	4.22	6.36	7.84
Accrued Prior Service Liability (000,000 omitted)									
5.0%	$2,677	$3,245	$3,893	$2,677	$3,245	$3,893	$2,677	$3,245	$3,893
6.5	2,056	2,525	3,079	1,826	2,241	2,731	1,826	2,241	2,731
8.0	1,639	1,989	2,431	1,307	1,585	1,939	1,307	1,585	1,939
Unfunded Liability (000,000 omitted)									
5.0%	$1,488	$2,056	$2,704	$1,488	$2,056	$2,704	$1,488	$2,056	$2,704
6.5	867	1,336	1,890	637	1,052	1,542	562	977	1,467
8.0	450	800	1,242	118	396	750	-0-	259	613
Annual Cost to Amortize Deficit by 2009 (000,000 omitted)									
5.0%	$ 103	$ 143	$ 188	$ 104	$ 143	$ 188	$ 104	$ 143	$ 188
6.5	70	108	153	51	85	124	45	79	118
8.0	42	74	115	11	37	69	-0-	24	57
Additional Support Rate									
5.0%	9.03%	12.47%	16.40%	9.03%	12.47%	16.40%	9.03%	12.47%	16.40%
6.5	6.10	9.40	13.30	4.48	7.40	10.85	3.92	6.89	10.29
8.0	3.63	6.45	10.02	0.95	3.19	6.05	-0-	2.09	4.97

Minnesota Teachers Retirement Association

Cash Flow Projection

Year Ending June 30	Contributions From Employees and Employers	Investment Income	Transfers to PRIF	Refunds	Ancillary Benefits	Administrative Expenses	Ratio of Income to Outgo
1984	$143,591,178	$121,393,902	$108,801,920	$ 9,569,309	$1,883,972	$1,477,238	2.18
1985	149,162,515	132,326,187	120,997,951	9,940,598	1,957,070	1,565,873	2.09
1986	154,950,021	142,900,793	133,976,599	10,326,293	2,033,005	1,659,825	2.01
1987	160,962,082	153,001,841	147,780,236	10,726,953	2,111,885	1,759,415	1.93
1988	170,619,807	162,509,346	162,453,340	11,370,571	2,238,598	1,864,980	1.87
1989	180,856,995	171,575,342	181,676,126	12,052,805	2,372,914	1,976,878	1.78
1990	191,708,415	179,793,247	202,620,814	12,775,973	2,515,289	2,095,491	1.69
1991	203,210,920	187,003,473	225,424,830	13,542,532	2,666,207	2,221,221	1.60
1992	215,403,575	193,045,469	250,235,894	14,355,084	2,826,179	2,354,494	1.51
1993	228,327,790	197,760,296	277,212,756	15,216,389	2,995,750	2,495,763	1.43
1994	242,027,457	200,993,489	306,525,992	16,129,372	3,175,495	2,645,509	1.35
1995	256,549,104	202,598,188	338,358,850	17,097,134	3,366,025	2,804,240	1.27
1996	271,942,051	202,438,516	372,908,158	18,122,962	3,567,986	2,972,494	1.19
1997	288,258,574	200,393,174	410,385,291	19,210,340	3,782,065	3,150,844	1.12
1998	305,554,088	196,359,213	451,017,211	20,362,961	4,008,989	3,339,895	1.05
1999	323,887,334	190,255,951	495,047,574	21,584,738	4,249,529	3,540,288	.98
2000	343,320,574	182,028,982	542,737,918	22,879,823	4,504,500	3,752,706	.92
2001	363,919,808	171,654,231	594,368,932	24,252,612	4,774,770	3,977,868	.85
2002	385,754,997	159,141,996	650,241,812	25,707,769	5,061,257	4,216,540	.80
2003	408,900,296	144,540,924	710,679,709	27,250,235	5,364,932	4,469,533	.74

Teachers Retirement Association
State of Minnesota

SCHEDULE OF TOTAL RESERVES REQUIRED JUNE 30, 1983

1.	For Post-Retirement Investment Fund Participation	$ 673,363,552.14
2.	For Variable Annuity Fund Participants	96,330,577.09
3.	For Active Members	2,578,371,308.00
4.	For Inactive Members	99,128,317.00
5.	For Other Annuitants	
	a. 1915 Law Retirement Annuities	50,760.49
	b. Disability Annuities	20,704,222.98
	c. Widow's Annuities	4,252,368.79
	d. Surviving Children's Annuities	62,929.62
	Total Other Annuitants	$ 25,070,281.88
	Total Required Reserves	$3,472,264,036.11

Certification

The above exhibit has been prepared in accordance with the provisions of Section 356.20. The required reserves for formula benefits have been computed in accordance with the entry age normal cost method.

Respectfully submitted,

BROWN AND FLOTT

Robert F. Flott

Robert F. Flott

Chicago, Illinois
November 2, 1983