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TEACHERS RETIREMENT ASSOCIATION

STATE OF MINNESOTA

REPORT OF ACTUARIAL VALUATION

June 30, 1981

Pursuant to Mn Stat 356.215, sd 3
annual

Teachers Retirement Association
State of Minnesota

As requested by the Board of Trustees of the Fund, we have made an actuarial valuation of the Fund as of June 30, 1981, in accordance with the provisions of Minnesota Statutes, Section 356.20 to 356.23. The results of our analysis are presented in the following report:

Liability for Annuities. Table 1 summarizes the census of annuities in force showing for each type of annuitant the number, annual amount and the present value of annuities. The present value was calculated using the 1971 Group Annuity Mortality Table for males set back 8 years with an interest assumption of 5%.

The liability for annuities shown in Table 1 are as follows:

Summary of Liability for Annuities

Post-Retirement Investment Fund	\$ 473,878,872.25
Variable Annuity Fund	470,343.01
Disability Benefits	15,294,538.95
1915 Law Annuities	61,634.64
Survivor Benefits	3,414,907.10
Total	<u>\$ 493,120,295.95</u>

Liability for Prior Service. Table 2 summarizes the census of active members and Table 3 the census of inactive members. These are shown separately for the Basic and Coordinated Group with each of these groups separated according to the benefit plan election in effect as of the date of this valuation. The accrued liability for prior service for each of these groups, exclusive of any participation in the Variable Annuity Fund, has been determined as follows:

Summary of Liability for Prior Service

<u>Active Members</u>	<u>Basic</u>	<u>Coordinated</u>
Full Formula	\$378,292,667	\$1,138,834,797
Former Partial Formula	97,432,307	432,294,195
Partial Formula	517,954	3,672,558
Total	<u>\$476,242,928</u>	<u>\$1,574,801,550</u>
<u>Inactive Members</u>		
Full Formula	\$ 20,534,944	\$ 39,327,962
Partial Formula	1,880,961	9,228,451
Total	<u>\$ 22,415,905</u>	<u>\$ 48,556,413</u>
Total accrued prior service liability		<u>\$2,122,016,796</u>

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The accrued prior service liability has been determined using the entry age normal cost method. The assumed rates of death, disability and withdrawal are shown in Table 4. It was assumed that individual salaries would increase at the rate of 3.5% each year. An interest assumption of 5% was used.

Assets of the Fund. Table 5 summarizes the assets and current liabilities of the Fund. As required by Section 11.25 Subd. 12(e), the Post-Retirement Investment Fund participation is adjusted to equal the required reserve for annuities being paid from that Fund. This is accomplished by establishing a pseudo-asset referred to as an annuity stabilization account amounting to \$10,888,625. As required by Section 356.20 Subd. 5, the deferred yield adjustment account, amounting to \$9,086,903 is shown as an asset. This account represents realized losses incurred in the disposition of debt securities. Bonds are shown at amortized cost. Common stocks are shown at cost. The cost of common stocks is reduced by \$2,438,454 as recognized unrealized depreciation. The market value of these stocks was \$43,439,760 more than cost.

Unfunded Liability. The difference between the actuarial liabilities and the assets available for funding these liabilities is the actuarial deficit or unfunded liability. The following table compares these amounts as of June 30, last year and this year. The liability for benefits payable from the Variable Annuity Fund is assumed to be equal to the participation in such fund included with the assets.

Required Reserves For:	6-30-80	6-30-81
Post-Retirement Investment Fund	\$ 418,018,377	\$ 473,878,872
Variable Annuity Fund	63,574,082	76,279,132
Other Annuities	16,388,601	18,771,080
Accrued Prior Service	1,863,140,184	2,122,016,796
Total Actuarial Liabilities	\$2,361,121,244	\$2,690,945,880
Assets in Excess of Current Liabilities	\$1,232,115,128	\$1,462,538,605
Unfunded Liability	\$1,129,006,116	\$1,228,407,275
Funding Ratio	52.2%	54.4%

During the year unfunded liabilities increased by \$99,401,159. An analysis of the causes of this increase is presented in the appendix to the report.

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Normal Support Rate. Current statutes provided for equal employer and employee contributions of 8.5% of salary for the Basic Group and 4.5% for the Coordinated Group. The entry age normal cost was determined as follows:

Basic

Full Formula	15.86%	
Former Partial Formula	16.60	
Partial Formula	14.86	
Aggregate		16.04%

Coordinated

Full Formula	8.95%	
Former Partial Formula	9.41	
Partial Formula	8.31	
Aggregate		9.06%

These entry age normal cost rates were used in the determination of the accrued liability for members under a formula plan.

Administrative Expense. The cost of administration of the Fund during the year amounted to \$1,091,290. This represents 0.10% of the current annual payroll.

Additional Support Rate. An additional employer contribution of 3.05% of salary is provided by statute to amortize the actuarial deficit. The following table shows for this year and last year the computations of the additional support rate required to amortize the actuarial deficit by June 30, 2009:

	<u>6-30-80</u>	<u>6-30-81</u>
(a) Unfunded Liability	\$1,129,006,116	\$1,228,407,275
(b) Annual Cost to Amortize by 2009	74,565,790	82,453,805
(c) Current Annual Payroll	971,670,262	1,040,186,471
(d) Additional Support Rate (b) / (c)	7.67%	7.93%

Interest at the rate of 5% on the current unfunded liability amounts to \$61,420,364 or 5.90% of the current annual payroll.

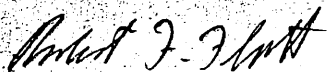
It is apparent that the additional support rate provided by statute is inadequate.

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Income From Investments. Income from investments earned during the year, and not allocated to the Post-Retirement Investment Fund or Variable Annuity Fund, amounted to \$100,578,183. This represents a return of 12.88% on the mean assets in excess of current liabilities excluding participation in the Variable Fund and the Post-Retirement Investment Fund. This includes realized gains of \$31,777,338 on sale of stocks. Interest at the rate of 12.75% was credited to members accumulated deposits.

Respectfully submitted,

BROWN AND FLOTT


Robert F. Flott

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TABLE 1

SUMMARY OF CENSUS OF ANNUITANTS

<u>Type of Annuity</u>	<u>Number</u>	<u>Annual Amount</u>	<u>Present Value</u>
<u>Annuities Payable from Post Retirement Investment Fund</u>			
1. <u>Service Retirement Annuitants</u>			
as of 6-30-80	9172	\$34,115,380.41	\$392,753,999.73
net adjustments made in 6-30-80 bal.	----	+1,763.52	
granted during year	718	4,237,415.68	
terminated by death	224	643,542.87	
expired	0	0	
cancelled	1	524.64	
	9665	37,710,492.10	
temporary annuities granted	17	90,672.36	
as of 6-30-81	9682	\$37,801,164.46	\$434,957,945.16
2. <u>Beneficiaries of Deceased Members</u>			
as of 6-30-80	112	\$ 410,709.12	\$ 4,304,232.42
net adjustments made in 6-30-80 bal.		-31.08	
granted during year	16	141,655.44	
expired	5	14,102.76	
as of 6-30-81	123	\$ 538,230.72	\$ 6,174,007.67
3. <u>Beneficiaries of Deceased Annuitants</u>			
as of 6-30-80	360	\$ 1,071,724.80	\$ 6,931,914.88
transfer from type 1	78	320,340.96	
expired	29	48,004.08	
as of 6-30-81	409	\$ 1,344,061.68	\$ 8,192,574.52
4. <u>Section 136.82 Supplemental Annuities</u>			
as of 6-30-80	140	\$ 80,194.68	\$ 923,154.20
net adjustments made in 6-30-80 bal.		-27.60	
terminated by death	0	0	
granted during year	13	11,240.64	
as of 6-30-81	153	\$ 91,407.72	\$ 1,028,470.30
5. <u>Section 354.59 Allowances and 354.581 Increases</u>			
as of 6-30-80		\$ 623,457.72	\$ 4,497,758.57
expirations		32,266.92	
as of 6-30-81		\$ 591,190.80	\$ 4,198,363.65
6. <u>Section 11.25, Subd. 12 1978 and 1981 Benefit Increases</u>			
as of 6-30-80		\$ 859,457.16	\$ 8,607,317.01
granted		1,033,575.36	
as of 6-30-81		\$ 1,893,032.52	\$ 19,327,510.95
Total 6-30-80 MPRIF	9784	\$37,160,923.89	\$418,018,376.81
Total 6-30-81 MPRIF	10367	\$42,259,087.90	\$473,878,872.25

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TABLE 1 (Cont'd)

SUMMARY OF CENSUS OF ANNUITANTS

<u>Type of Annuity</u>	<u>Number</u>	<u>Annual Amount</u>	<u>Present Value</u>
<u>Annuities Payable from Variable Annuity Fund</u>			
<u>7. Service Retirement Annuitants</u>			
as of 6-30-80	89	\$ 25,000.24	\$ 336,416.48
net adjustment in 6-30-80 bal.		+1,203.08	
granted during year	26	8,767.68	
	115	34,971.00	
temporary annuity granted	1	260.88	
as of 6-30-81	116	\$ 35,231.88	\$ 470,343.01
<u>Other Annuities and Benefits</u>			
<u>8. Disability Annuitants</u>			
as of 6-30-80	200	\$ 959,857.08	\$ 13,566,424.00
net adjustments made in 6-30-80 bal.		- 192.48	
returned to teaching	3	26,339.88	
granted during year	36	236,481.72	
terminated by death	15	55,897.56	
transfers to type 1	19	57,527.76	
as of 6-30-81	199	\$ 1,056,381.12	\$ 14,874,319.19
<u>9. Survivors Benefits</u>			
as of 6-30-80	115	\$ 220,684.56	\$ 2,552,049.75
granted during year	9	48,600.00	
terminated	11	13,389.36	
as of 6-30-81	113	\$ 255,895.20	\$ 3,279,717.31
<u>10. 1915 Law Retirement Annuitants</u>			
as of 6-30-80	10	\$ 14,609.04	\$ 64,489.39
terminated by death	0	0	
as of 6-30-81	10	\$ 14,609.04	\$ 61,634.64
<u>11. Section 354.44, Subd. 5 Increases</u>			
as of 6-30-80	--	\$ 2,400.00	\$ 10,715.04
terminated by death		0.00	
as of 6-30-81	--	\$ 2,400.00	\$ 10,241.04
<u>12. Section 11.25, Subd. 12 1978 and 1981 Benefit Increases</u>			
as of 6-30-80		\$ 15,806.64	\$ 205,638.61
granted		25,450.44	
as of 6-30-81		\$ 41,257.08	\$ 555,409.55

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TABLE 2

SUMMARY OF CENSUS OF ACTIVE MEMBERS

	<u>Basic Group</u>		<u>Coordinated Group</u>	
	<u>Number</u>	<u>Annual Payroll</u>	<u>Number</u>	<u>Annual Payroll</u>
<u>Full Formula</u>				
At 6-30-80	2518	\$52,646,809	51,142	\$675,448,216
New Entrants	24		7,344	
To Inactive	2		2,195	
Separation with Refund	1		4,352	
Deaths	9		46	
Disability Retirement	10		19	
Service Retirement	<u>223</u>		<u>405</u>	
At 6-30-81	2297	\$51,735,188	51,469	\$732,579,495
<u>Former Partial Formula</u>				
At 6-30-80	669	\$15,683,431	10,969	\$225,408,523
To Inactive	2		107	
Separation with Refund	0		152	
Deaths	0		8	
Disability Retirement	0		7	
Service Retirement	<u>13</u>		<u>45</u>	
At 6-30-81	654	\$16,363,715	10,650	\$236,999,651
<u>Partial Formula</u>				
At 6-30-80	4	\$ 96,910	121	\$ 2,386,373
Separation with Refund	<u>0</u>		<u>6</u>	
At 6-30-81	4	\$ 102,907	115	\$ 2,405,515
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Total at 6-30-80	3191	\$68,427,150	62,232	\$903,243,112
Total at 6-30-81	2955	\$68,201,810	62,234	\$971,984,661

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TABLE 3

SUMMARY OF CENSUS OF INACTIVE MEMBERS

	<u>Basic Group</u>		<u>Coordinated Group</u>	
	<u>Number</u>	<u>Projected Annuity</u>	<u>Number</u>	<u>Projected Annuity</u>
<u>Full Formula</u>				
At 6-30-80	579	\$1,866,091	12,092	\$6,172,656
From Active	2		2,195	
Separation with Refund	8		149	
Deaths	0		7	
Service Retirement	12		18	
Write-offs	<u>15</u>		<u>1,284</u>	
6-30-81	546	\$2,149,101	12,829	\$7,050,130
<u>Partial Formula</u>				
At 6-30-80	24	\$ 187,438	765	\$1,346,905
From Active	2		107	
Separation with Refund	0		12	
Deaths	0		3	
Service Retirement	0		2	
Write-offs	<u>0</u>		<u>11</u>	
At 6-30-81	26	\$ 241,515	844	\$1,709,699
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Total at 6-30-80	603	\$2,053,529	12,857	\$7,519,561
Total at 6-30-81	572	\$2,390,616	13,673	\$8,759,829

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TABLE 4

ASSUMED RATES OF DECREMENT USED IN
VALUATION OF FORMULA PLAN BENEFITS

<u>Age</u>	<u>Death</u>	<u>Disability</u>	<u>Withdrawal</u>
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.

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Table 5

ASSETS AND CURRENT LIABILITIES

A. Assets

Deposits in banks	\$	469,668.91
Accounts Receivable:		
Accrued members' contributions		6,358,723.99
Accrued employers' contributions		19,207,515.05
Post-Retirement Investment Fund		3,425,713.86
Variable Annuity Fund		207,339.50
Department of Education		607,680.96
Other		9,884.28
Accrued interest on investments		14,808,121.77
Dividends on stock, declared but not yet received		1,400,000.34
Investment in bonds at amortized cost		432,432,758.33
Investment in stocks at cost		294,752,537.12
Short term investments		132,950,148.85
Deferred Yield Adjustment Account		9,086,903.19
Recognized unrealized appreciation in stocks		(2,438,454.21)
Participation in MPRI Fund-Admitted Value		473,878,872.25
Participation in Minnesota Variable Annuity Fund		76,279,131.99
Equipment at cost, less depreciation		14,621.41
Total Assets	\$	\$1,463,451,167.59

B. Current Liabilities

Accounts Payable:		
Annuity payments	\$	2,562.81
Accrued expenses		51,044.29
Investment Purchases in process		858,393.00
Miscellaneous		562.00
Total Current Liabilities	\$	912,562.10

C. Assets in Excess of Current Liabilities \$1,462,538,605.49

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APPENDIX TO VALUATION REPORT

ACTUARIAL ANALYSIS OF CHANGE IN UNFUNDED LIABILITIES

As indicated in the report of actuarial valuation, during the current year the unfunded liability increased by \$99,401,159. The causes of this increase may be summarized as follows:

Increases:

Actuarial loss - salary increases	\$151,432,582
Contribution deficiency	23,464,399
Actuarial loss - ancillary benefits	355,712
PRIF - mortality loss	254,306

Decreases:

Actuarial gain - Pre-Retirement Terminations	13,702,537
Actuarial gain - investment income	<u>62,403,303</u>

Net Increase	\$ 99,401,159
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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 12.5%. This departure from the assumed rate increased the deficit by \$151,432,582.

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 \$23,464,399 less than this required amount.

Ancillary benefits include disability, surviving spouse, surviving children and 1915 law annuities in force. The cost of these benefits in the current year was \$355,712 more than expected.

Annuitants receiving benefits from the Post-Retirement Investment Fund experienced mortality more favorable than expected resulting in an actuarial loss of \$254,306. This amount is transferred from the basic fund to the Post-Retirement Investment Fund.

Members terminated service prior to retirement at a rate greater than expected, releasing required reserves. This resulted in an actuarial gain of \$13,702,537.

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 \$62,403,303.

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SUMMARY OF BENEFIT 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. Annuity 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 $\frac{1}{2}$ of 1% for each month between actual retirement date and normal retirement date less $\frac{1}{4}$ of 1% for each month after actual retirement and attainment of 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 determined as for early retirement and increased by compound interest from the date service terminated to the date annuity payments begin. Interest will be at 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.

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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 - an 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.

6. Other Separation Benefits

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

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SCHEDULE OF TOTAL RESERVES REQUIRED JUNE 30, 1981


1. <u>For Post-Retirement Investment Fund Participation</u>	\$ 473,878,872.25
2. <u>For Variable Annuity Fund Participants</u>	76,279,131.99
3. <u>For Active Members</u>	2,051,044,478.00
4. <u>For Inactive Members</u>	70,972,318.00
5. <u>For Other Annuitants</u>	
a. 1915 Law Retirement Annuities	61,634.64
b. Disability Annuities	15,294,538.95
c. Widow's Annuities	3,354,311.22
d. Surviving Children's Annuities	<u>60,595.88</u>
Total	\$ 18,771,080.69
Total Required Reserves	<u><u>\$2,690,945,880.93</u></u>

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

November 19, 1981