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TEACHER'S RETIREMENT ASSOC.**

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STATE OF MINNESOTA

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REPORT OF ACTUARIAL VALUATION

JUNE 30, 1978

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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, 1978, 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 6 years with an interest assumption of 5%.

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

Summary of Liability for Annuities

Adjustable Fixed Benefit Fund	\$ 327,181,507.46
Variable Annuity Fund	146,211.42
Disability Benefits	8,632,861.10
1915 Law Annuities	113,335.05
Survivor Benefits	2,119,650.27
Total	<u>\$ 338,193,565.30</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>Basic</u>	<u>Coordinated</u>
<u>Active Members</u>		
Full Formula	\$343,915,237	\$ 684,243,595
Former Partial Formula	68,161,957	187,263,722
Partial Formula	<u>330,307</u>	<u>1,640,079</u>
Total	\$412,407,501	\$ 873,147,396
<u>Inactive Members</u>		
Full Formula	\$ 16,318,733	\$ 27,848,754
Partial Formula	<u>928,836</u>	<u>4,886,256</u>
Total	\$ 17,247,569	\$ 32,735,010
Total accrued prior service liability		\$1,335,537,476

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In 1978 members participating in the variable annuity program were given an opportunity to transfer to the full formula program. Members making this transfer are referred to herein as the Former Partial Formula group. For service prior to the transfer there was no increase in accrued benefits or the liability for such benefits. The normal cost for such members has been increased accordingly.

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.

In addition to the members listed in Tables 2 and 3 there were 15 active and 47 inactive members who remain in the full variable group. The prior service liability for these members is assumed to be included in the Variable Annuity Fund participation.

Assets of the Fund. Table 5 summarizes the assets and current liabilities of the Fund. As required by Section 356.20 Subd. 5, the deferred yield adjustment account, amounting to \$6,862,656 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 market value of these stocks was \$3,940,912 less than cost. Of this difference only \$461,707 has been recognized in Table 5. As required by Section 11.25 Subd. 12(e), the Adjustable Fixed Benefit 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 \$17,682,877.

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.

	6-30-77	6-30-78
Required Reserves For:		
Adjustable Fixed Benefit Fund	\$ 294,512,432	\$ 327,181,507
Variable Annuity Fund	43,751,951	59,191,856
Other Annuities	9,224,677	10,865,846
Accrued Prior Service	1,115,493,553	1,335,537,476
Total Actuarial Liabilities	<u>\$1,462,982,613</u>	<u>\$1,732,776,686</u>
Assets in Excess of Current Liabilities	\$ 822,410,185	\$ 940,345,339
Unfunded Liability	\$ 640,572,428	\$ 792,431,347
Funding Ratio	56.2%	54.3%

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During the year unfunded liabilities increased by \$151,858,919. An analysis of the causes of this increase is presented in the appendix to this report.

Annuity Stabilization Account, If Not Recognized. In determination of the unfunded liability and funding ratio shown above, the Annuity Stabilization Account of the MAFB Fund in the amount of \$17,682,877 was included as part of the assets of the fund. Since this amount represents a receivable due from future earnings of the MAFB Fund, presented below is information showing the effects of not including the Annuity Stabilization Account as part of the assets of the fund:

	<u>7-30-77</u>	<u>6-30-78</u>
Assets in Excess of Current Liabilities	\$803,279,377	\$922,662,462
Unfunded Liability	659,703,236	810,114,223
Funding Ratio	54.9%	53.2%

Normal Support Rate. Current statutes provide for equal employer and employee contributions of 8% of salary for the Basic Group and 4% for the Coordinated Group. The entry age normal cost was determined as follows:

Basic

Full Formula	15.41%
Former Partial Formula	16.12
Partial Formula	14.38
Aggregate	15.56

Coordinated

Full Formula	8.53
Former Partial Formula	9.16
Partial Formula	7.91
Aggregate	8.69

These entry age normal cost rates were used in the determination of the accrued liability for members under a formula plan. Effective July 1, 1979 employee contributions will increase to 8.5% for basic and 4.5% for coordinated members.

Administrative Expense. The cost of administration of the Fund during the year amounted to \$845,898. This represents 0.11% of the current annual payroll.

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Additional Support Rate. An additional employer contribution of 3% 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, 1997.

	<u>6-30-77</u>	<u>6-30-78</u>
(a) Unfunded Liability	\$ 640,572,428	\$ 792,431,347
(b) Annual Cost to Amortize by 1997	51,401,189	65,569,740
(c) Current Annual Payroll	802,761,084	845,898,496
(d) Additional Support Rate (b) / (c)	6.40%	7.75%

Interest at the rate of 5% on the current unfunded liability amounts to \$39,621,567 or 4.68% of the current annual payroll.

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

Income From Investments. Income from investments earned during the year, and not allocated to the Adjustable Fixed Benefit Fund or Variable Annuity Fund, amounted to \$30,062,224. This represents a return of 5.96% on the mean assets in excess of current liabilities excluding participation in the Variable Fund and the Adjustable Fixed Benefit Fund. This includes a decrease in the recognized unrealized appreciation on stocks in the amount of \$1,976,748 and realized gains of \$1,378,041 on sale of stocks. Interest at the rate of 6.50% was credited to members accumulated deposits.

Respectfully submitted,

BROWN AND FLOTT

Robert F. Flott

Robert F. Flott

Teachers Retirement Association
State of Minnesota

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 Adjustable Fixed Benefit Fund</u>			
<u>1. Service Retirement Annuitants</u>			
as of 6-30-77	7682	\$24,766,115.98	\$271,530,489.26
net adjustments made in 6-30-77 bal.	---	-864.36	
granted during year	712	3,383,777.98	
section 11.25 increase	---	821,453.88	
terminated by death	-142	-378,185.04	
expired	-4	-7,173.12	
cancelled	-1	-2,751.84	
as of 6-30-78	8247	\$28,582,373.48	\$312,237,316.92
<u>2. Beneficiaries of Deceased Members</u>			
as of 6-30-77	110	\$ 323,037.84	\$ 2,872,801.16
granted during year	10	64,281.12	
section 11.25 increase	---	11,090.76	
expired	-5	-12,216.12	
as of 6-30-78	115	386,193.60	\$ 3,703,783.50
<u>3. Beneficiaries of Deceased Annuitants</u>			
as of 6-30-77	309	\$ 740,702.64	\$ 4,661,068.24
transfer from type 1	41	114,113.04	
section 11.25 increase	---	31,988.52	
expired	-33	-67,669.44	
as of 6-30-78	317	\$ 819,134.76	\$ 5,331,496.25
<u>4. Section 136.82 Supplemental Annuities</u>			
as of 6-30-77	105	\$ 49,555.80	\$ 553,064.46
net adjustments made in 6-30-77 bal.	---	5.52	
granted during year	13	8,821.20	
section 11.25 increase	---	798.48	
terminated by death	-3	-1,094.52	
as of 6-30-78	115	\$ 58,086.48	\$ 645,534.50
<u>5. Section 354.59 Allowances and 354.581 Increases</u>			
as of 6-30-77	---	\$ 761,386.08	\$ 5,521,320.23
section 11.25 increase	---	28,766.16	
expirations	---	-43,076.52	
as of 6-30-78	----	\$ 747,075.72	\$ 5,263,376.29
 Total 6-30-77 MAFBF	 8206	 \$26,640,798.34	 \$285,138,743.35
Total 6-30-78 MAFBF	8794	\$30,592,864.04	\$327,181,507.46

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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>6. Service Retirement Annuitants</u>			
as of 6-30-77	34	\$ 5,398.44	\$ 71,567.66
net adjustments for variable gain	---	494.04	
granted during year	17	5,097.00	
as of 6-30-78	51	\$ 10,989.48	\$ 146,211.42
<u>Other Annuities and Benefits</u>			
<u>7. Disability Annuitants</u>			
as of 6-30-77	137	\$ 507,596.16	\$ 7,101,515.91
net adjustments made in 6-30-77 bal.	---	-6.12	
granted during year	51	242,982.60	
section 11.25 increase	---	12,656.88	
returned to teaching	-6	-18,779.76	
terminated by death	-15	-77,560.56	
transfers to type 1	-12	-44,297.28	
as of 6-30-78	155	\$ 622,591.92	\$ 8,632,861.10
<u>8. Survivors Benefits</u>			
as of 6-30-77	143	\$ 193,866.96	\$ 1,993,990.97
granted during year	3	11,775.00	
section 11.25 increase	---	6,021.48	
terminated	-22	-18,351.84	
as of 6-30-78	124	\$ 193,311.60	\$ 2,119,650.27
<u>9. 1915 Law Retirement Annuitants</u>			
as of 6-30-77	21	\$ 31,254.36	\$ 129,169.64
terminated by death	-2	-3,035.16	
as of 6-30-78	19	\$ 28,219.20	\$ 113,335.05
<u>10. Section 354.44 Subd. 5 Increases</u>			
as of 6-30-77	---	\$ 5,040.00	\$ 21,060.72
terminated by death	---	-480.00	
as of 6-30-78	---	\$ 4,560.00	\$ 18,531.84

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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 6-30-77	3,078	\$53,638,745	47,870	\$535,037,513
New Entrants	140		4,990	
To Inactive	16		863	
Separation with Refund	37		4,095	
Deaths	17		50	
Disability Retirement	9		40	
Service Retirement	<u>218</u>		<u>382</u>	
At 6-30-78	2,921	\$54,021,014	47,430	\$570,927,883
<u>Former Part Formula</u>				
At 6-30-77	0	-0-	0	-0-
Election Transfer	<u>699</u>		<u>11,497</u>	
At 6-30-78	699	\$14,541,264		\$204,140,886
<u>Partial Formula</u>				
At 6-30-77	705	\$13,980,210	12,285	\$199,999,779
Election Transfer	699		11,497	
New Entrants	0		0	
To Inactive	2		213	
Separation with Refund	0		403	
Deaths	0		16	
Disability Retirement	0		2	
Service Retirement	<u>0</u>		<u>22</u>	
At 6-30-78	4	\$83,965	132	\$ 2,183,484
Total at 6-30-77	3,783	\$67,618,955	60,155	\$735,037,292
Total at 6-30-78	3,624	\$68,646,243	59,059	\$777,252,253

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TABLE 3

SUMMARY OF CENSUS OF INACTIVE MEMBERS

	<u>Basic Group</u>	<u>Coordinated Group</u>
<u>Full Formula</u>		
At 6-30-77	894	15,389
From Active	16	863
Separation with Refund	56	335
Write-Offs	107	3,141
Deaths	0	17
Service Retirement	<u>45</u>	<u>42</u>
At 6-30-78	702	12,717
<u>Partial Formula</u>		
At 6-30-77	18	694
From Active	2	213
Separation with Refund	0	12
Write-Offs	1	16
Deaths	0	0
Service Retirement	<u>3</u>	<u>0</u>
At 6-30-78	16	879
<hr/>		
Total at 6-30-77	912	16,083
Totat at 6-30-78	718	13,596

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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 6 years.

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TABLE 5

ASSETS AND CURRENT LIABILITIES

A. <u>Assets</u>	
Deposits in banks	\$ 311,864.28
Accounts Receivable:	
Accrued members' contributions	4,778,612.33
Accrued employer's contributions	15,070,688.14
Minnesota Variable Annuity Fund	69,911.65
Minnesota Adjustable Fixed Benefit Fund	4,989,946.54
Social Security Retirement Division	827.85
Interest charges on late remittances	17,908.76
Other	21,410.00
Accrued interest on investments	5,011,104.10
Dividends on stock, declared but not yet received ..	147,396.13
Investment in bonds at amortized cost	253,670,210.48
Investment in common stocks at cost	241,508,424.87
Short term investments	22,000,063.89
Deferred Yield Adjustment Account	6,862,565.06
Recognized unrealized appreciation in stocks	(461,706.63)
Participation in MAFB Fund-Admitted Value	309,498,630.76
Participation in MAFB Fund-Annuity Stabilization A/C ..	17,682,876.70
Participation in Minnesota Variable Annuity Fund ..	59,191,856.45
Equipment at cost, less depreciation	27,284.29
Total Assets	<u>\$ 940,399,966.65</u>
B. <u>Current Liabilities</u>	
Accounts Payable:	
Annuity payments	\$ 1,288.05
Accrued expenses	53,339.46
Total Current Liabilities	<u>\$ 54,627.51</u>
C. <u>Assets in Excess of Current Liabilities</u>	\$ 940,345,339.14

Teachers Retirement Association
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APPENDIX TO VALUATION REPORT

1. ACTUARIAL ANALYSIS OF CHANGE IN UNFUNDED LIABILITIES

As indicated in the report of actuarial valuation, during the current year the unfunded liability increased by \$151,858,919. The causes of this increase may be summarized as follows:

Increases:

Changes in actuarial assumptions	\$109,743,263
Actuarial loss - salary increases	47,804,101
Contribution deficiency	6,294,606
Legislated ancillary benefit increases	310,453
AFBF mortality loss	289,574

Decreases:

Change in augmentation rate	6,815,806
Actuarial gain - investment income	5,538,752
Actuarial gain - ancillary benefits	<u>228,520</u>

Net Increase	\$151,858,919
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As of June 30, 1978 the actuarial assumptions and formulae used in determining the liability for prior service of active members were revised. These revisions increased this liability by \$109,743,263. The entry age normal cost rates were also affected by these revisions. The new pre-retirement termination rates are shown in Table 4 of the actuarial valuation. These revisions were necessary to reflect changes in actual and expected experience resulting from changes in the active member population. Data in this regard will be presented in the next experience study.

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 7.5%. This departure from the assumed rate increased the deficit by \$47,804,101.

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 \$6,294,606 less than this required amount.

On December 1, 1977 lump sum payments amounting to \$23,388 were paid to recipients of ancillary benefits which began before July 1, 1973. On January 1, 1978 ancillary benefits were increased at the same rate as applied to annuities being paid from the Adjustable Fixed Benefit Fund. The cost of these increases was \$287,065.

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APPENDIX TO VALUATION REPORT

Annuitants receiving benefits from the Adjustable Fixed Benefit Fund experienced mortality more favorable than expected resulting in an actuarial loss of \$289,574. This amount is transferred from the basic fund to the Adjustable Fixed Benefit Fund.

Effective January 1, 1980 the rate at which deferred annuities are augmented was decreased from 5% to 3%. This change reduced the liability for these annuities by \$6,815,806.

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 \$5,538,752.

Ancillary benefits include disability, surviving spouse, surviving children and 1915 law annuities in force. The cost of these benefits in the current year was \$228,520 less than expected.

2. POST-RETIREMENT MORTALITY IN ADJUSTABLE FIXED BENEFIT FUND

During the current year the difference between tabular and actual reserves released due to the death of annuitants amounted to \$289,574. This is the fourth consecutive year in which fewer annuitants died than were expected. During this period only 552 deaths of annuitants occurred whereas 678 were expected according to the current post-retirement mortality assumption.

In view of this experience the current post-retirement mortality assumption will be revised before the next actuarial valuation. We estimate this change will increase total actuarial liabilities by 5% or about \$85,000,000. The normal cost for active members will also increase by about 5%.

Teachers Retirement Association
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SCHEDULE OF TOTAL RESERVES REQUIRED JUNE 30, 1978


1. <u>For Adjustable Fixed Benefit Fund Participation</u>	\$ 327,181,507.46
2. <u>For Variable Annuity Fund Participants</u>	59,191,856.45
3. <u>For Active Members</u>	1,285,554,897.00
4. <u>For Inactive Members</u>	49,982,579.00
5. <u>For Other Annuitants</u>	
a. 1915 Law Retirement Annuities	113,335.00
b. Disability Annuities	8,632,861.00
c. Widow's Annuities	1,988,924.00
d. Surviving Children's Annuities	<u>130,726.00</u>
Total	\$ 10,865,846.00 =====
Total Required Reserves	\$ 1,732,776,685.91

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

December 18, 1978