November 19, 1971

INTRODUCTION

Name of Association Minnesota Highway Patrol Officers' Retirement Association

In accordance with Chapter 359 of the 1965 Minnesota Laws, Chapter 249 of the 1967 Minnesota Laws, and Chapter 289 of the 1969 Minnesota Laws, an actuarial valuation as of June 30, 1971 has been made of this retirement association. The valuation covers the membership of the fund as shown in the census of members and survivors of deceased members, which is included in this report. The details of the benefits under the plan, assets in the fund, income of the fund, and membership data were furnished by the Association.

This report covers the following items:

A. Benefits of the Plan and Contributions.

B. Assumptions in Actuarial Valuation.

C. Results of Valuation.

D. Discussion of Results.

E. Analysis of Change in the Unfunded Accrued Liability.

F. Census of Membership and Benefits as of June 30, 1971.

G. Analysis of Changes in Membership.

H. Average Ages at Entry and Retirement.

I. Certification by Actuary.

MINNESOTA HIGHWAY PATROL OFFICERS' RETIREMENT FUND

A. BENEFITS OF PLAN AND CONTRIBUTIONS

This plan provides the following major benefits:

1. Retirement Benefit.

    a. Requirements for retirement.

    (1) Age 55 and 10 years of service required for full service benefit.

    (2) 10 years of service required for vesting of deferred annuity benefit with payments to start at age 55.

    b. Monthly annuity:

    2 1/2% of average covered monthly salary for each year up to and including 20 years; 2% for each year of service in excess of 20.

2. Disability Benefit.

    a. Requirements:

In Line of Duty:	None.
Not in Line of Duty:	5 years of service and age less than 55.

    b. Monthly Annuity:

In Line of Duty:	50% of average covered monthly salary plus 2% for each year of service in excess of 20.
Not in Line of Duty:	2 1/2% of average covered monthly salary for each year up to and including 20 years plus 2% for each year in excess of 20; a minimum of 25%.

3. <u>Widow's and Orphan's Benefits</u>.

a. Active members:

(1) Death benefit before retirement:

Widow:	20% of average covered monthly salary.
Orphans:	8% of average covered monthly salary to age 18 for each child plus $20 per month prorated equally to such children.

(Maximum total orphan benefit $200 per month.)

(2) Death benefit after retirement:

None (actuarial equivalent of life annuity may be chosen under an option to provide a widow's benefit). However, the widows of those members who retired or separated from the fund with vested benefits prior to January 1, 1965 will receive $75 per month.

b. Retired member: None.

4. <u>Other Death Benefit (lump sum)</u>: None.

5. <u>Termination of Employment Benefit</u>:

Automatic refund without interest if less than 10 years of service. Must be requested if 10 years or more of service - otherwise vested with the benefit at age 55. No refunds after 20 years of service.

6. <u>Contributions</u>:

Member:	7.0% of salary
Employer Regular:	11.2% of salary
Employer Additional:	8.0% of salary
Total	26.2% of salary

B. ASSUMPTIONS IN ACTUARIAL VALUATION

1.	Mortality:	United States Life Tables, 1959-61 (White Males and White Females). These tables were used for both active and retired members, and for survivors.
2.	Disability:	The rates of disability were adapted from experience of the New York State Employees' Retirement System, graduated and extrapolated as required for this valuation.
3.	Withdrawal:	A rate of withdrawal of .030 at age 20 decreasing uniformly to zero at age 50 with no withdrawals after that age.
4.	Salary Scale:	Salaries were assumed to increase 3 1/2% each year.
5.	Retirement Age:	The assumed average ages at retirement for this fund were 57.1 for the Highway Patrol group and 62.5 for the State Police Officers group.
6.	Interest:	3 1/2%, compounded annually.

It is felt that these assumptions are appropriate for the valuation of this fund on a realistic basis.

C. RESULTS OF VALUATION

1. Valuation.

Normal Cost of Benefits	$ 970,756
Administrative Expense	6,724
Accrued Liability	21,399,349

2. Current Deficit from Full Funding.

Accrued Liability	$ 21,399,349
Assets in Fund *	10,993,892
Unfunded Accrued Liability	$ 10,405,457

3. Annual Payment to Achieve Full Funding by 1997.

Annual Deposit to Retire Deficit by 1997	$ 595,192
Total Normal Cost	970,756
Administrative Expense	6,724
Total Annual Payment	$ 1,572,672

4. Minimum Contribution to Prevent Increase in Deficit.

Interest on Deficit at 3.5%	$ 364,191
Total Normal Cost	970,756
Administrative Expense	6,724
Minimum Contribution	$ 1,341,671

5. Income of Fund during Fiscal Year Ending June 30, 1971.*

Members' Contributions	$ 511,797
Taxes or Public Funds	1,354,020
Total Contributions	$ 1,865,817
Investment Income	$ 427,594

6. Annual Payroll. *

Total Payroll as of 6-30-71	$ 7,311,243

* Data furnished by Association.

D. DISCUSSION OF RESULTS

The valuation was made by a method known as the entry age normal cost method. Under this method, the normal cost is determined based on the age at hire of each member. This normal cost is the annual deposit required (using the assumptions outlined in Section B above) to pay for the cost of each member's prospective benefits over a period from his date of hire to his date of retirement. This normal cost is determined as a level percentage of payroll; therefore, future increases in payroll will produce increases in the number of dollars of normal cost.

The elements of normal cost for this plan are:

Type of Benefit	Normal Cost
Service Retirement Benefit	$ 651,233
Disability Benefit	153,609
Withdrawal Benefit	2,808
Survivor's Benefit	116,217
Vesting	46,889
Total Normal Cost	$ 970,756

This total normal cost and the administrative expense equal 13.37% of the total payroll as of June 30, 1971.

When a retirement plan is fully funded, the fund contains an amount equal to the accumulation (under the actuarial assumptions made) of the normal cost for each member from his date of hire to the date of the valuation. This accumulation is called the accrued liability or the required reserve.

The elements of accrued liability for this plan are:

Type of Benefit	Accrued Liability
1. Active Members	
Retirement Benefit	$ 13,935,393
Disability Benefit	1,191,006
Withdrawal Benefit	12,618
Survivor's Benefit	893,803
Vesting	461,204
Total for Active Members	$ 16,494,024
2. Inactive Members	
Retired	$ 3,308,983
Deferred Retired	275,225
Widows	676,427
Orphans	89,458
Survivor's Benefit	555,232
Total for Inactive Members	$ 4,905,325
Total Accrued Liability	$ 21,399,349

A retirement plan which is fully funded requires future contributions no larger than the sum of the administrative expense and the normal costs for all active members to pay for the prospective benefits (if the assumptions made are realized exactly). To the extent that normal costs and administrative expenses have not been paid in the past, a plan is not fully funded. The amount by which the plan is short of full funding is called the unfunded accrued liability of the fund. In other words, the unfunded accrued liability is the excess of the accrued liability over the actual assets of the fund.

The amount of annual contribution which would be required to pay each year's normal cost, the administrative expenses and eliminate the deficit by 1997 is the "total annual payment" shown in Section C of this report.

The deficit in the fund will increase unless at least 3 1/2% interest on the deficit is paid each year in addition to the normal cost and the administrative expenses. The sum of these three amounts should be regarded as the minimum annual contribution to the fund in order to keep the deficit at its present size. This "minimum contribution" is shown in Section C of this report.

E. ANALYSIS OF CHANGE IN THE UNFUNDED ACCRUED LIABILITY

In preparing the 1971 valuation, it was discovered that a program error in the 1970 valuation had caused an overstatement of $531,534 in the Inactive Reserve for Survivors Benefits. The corrected Accrued Liability would have been $20,588,244. Thus, the change in the Unfunded Accrued Liability appears as follows:

As of 6-30-70		
Accrued Liability (Corrected)	$ 20,588,244	
Assets	9,098,829	
Unfunded Accrued Liability		$ 11,489,415
As of 6-30-71		
Accrued Liability	$ 21,399,349	
Assets	10,993,892	
Unfunded Accrued Liability		10,405,457
Decrease in Unfunded Accrued Liability		$ 1,083,958
Decreases:		
Amortization Contribution	$ 568,959	
Excess Interest	205,937	
Capital Gain	40,412	
Mortality and Termination Gain	122,325	
Gain on Continued Service of Older Members (SPO)	76,122	
Other Actuarial Gains	183,651	
		$ 1,197,406
Increases:		
Salary Scale Loss		113,448
		$ 1,083,958

F. CENSUS OF MEMBERSHIP AND BENEFITS AS OF JUNE 30, 1971

Status	Number	Annual Payroll
Active Members	711	$ 7,311,243

Status	Number	Annual Benefit
Service Retirements	123	$ 347,594
Disability Retirements	1	3,684
Widow Annuitants	51	57,523
Orphan Annuitants	32	16,445

Status	Number	Annual Benefit
Deferred Annuitants	14	$ 28,110

G. ANALYSIS OF CHANGES IN MEMBERSHIP

	Highway Patrol	State Police Officers
Active Members		
Number as of 6-30-70	455	196
New Entrants	57	18
Total	512	214
Deaths	0	0
Withdrawals with Vested Benefits	1	0
Withdrawals without Vested Benefits	1	4
Retired	7	2
Disabled	0	0
Total Terminations	9	6
Number as of 6-30-71	503	208
Service Retirements		
Number as of 6-30-70	74	42
Newly Retired	7	2
Transfer from Deferred Status	1	0
Transfer from Disabled Status	0	0
Total	82	44
Deaths	2	1
Number as of 6-30-71	80	43
Disabled Annuitants		
Number as of 6-30-70	1	0
Newly Disabled	0	0
Total	1	0
Transfer to Retired Status	0	0
Number as of 6-30-71	1	0

	Highway Patrol	State Police Officers
Widow Annuitants		
Number as of 6-30-70	25	26
Newly Widowed	2	0
Total	27	26
Deaths	1	1
Number as of 6-30-71	26	25
Orphan Annuitants		
Number as of 6-30-70	26	10
Newly Orphaned	0	0
Total	26	10
Orphans Attaining Maximum Age	1	3
Number as of 6-30-71	25	7
Deferred Annuitants		
Number as of 6-30-70	9	6
New Deferred Annuitants	1	0
Total	10	6
Transfer to Retired Status	1	0
Refunds	0	1
Deaths	0	0
Total Terminations	1	1
Number as of 6-30-71	9	5

H. AVERAGE AGES AT ENTRY AND RETIREMENT

		Highway Patrol	State Police Officers
The average age at which employment commences is as follows:			
All Current Members		27.0	31.3
New Entrants Fiscal Year	1966-1967	26.5	38.0
	1967-1968	25.9	N.A.
	1968-1969	26.4	33.0
	1969-1970	26.0	30.2
	1970-1971	25.4	30.9
The average age at which service retirements have taken place is as follows:			
All Current Service Retirements		57.7	65.4
New Retireds Fiscal Year	1966-1967	58.9	66.0
	1967-1968	60.5	69.0
	1968-1969	56.7	65.0
	1969-1970	55.0	63.0
	1970-1971	58.9	59.0

I. CERTIFICATION BY ACTUARY

Name of Association Minnesota Highway Patrol Officers' Retirement Association

We hereby certify that this actuarial valuation of the above named Association was made as of June 30, 1971, on the basis of accepted actuarial methods and procedures. The survey was completed in accordance with the requirements of Chapter 359 of Minnesota Laws 1965, Chapter 249 of Minnesota Laws 1967 and Chapter 289 of Minnesota Laws 1969.

Franklin C. Smith

Franklin C. Smith
Associate, Society of Actuaries
GEORGE V. STENNES & ASSOCIATES

GVS Minnesota Memorandum No. 71-5
December 10, 1971

HIGHWAY PATROLMEN VALUATION AS OF JUNE 30, 1971

The purpose of this memorandum is to discuss the valuation report of the Minnesota Highway Patrol Officers Retirement Association which was submitted to the Commission in accordance with Chapter 249 of Minnesota Laws 1967 and Chapter 289 of Minnesota Laws 1969. The valuation was made by our office using the entry age normal cost method and assuming 3 1/2% interest. The Plan includes the State Police officers as well as the members of the Highway Patrol.

This memorandum contains the following:

1. Statistical and Valuation Data;
2. Discussion of Valuation Results;
3. Conclusion.

1. Statistical and Valuation Data

Results of the valuation reports as of June 30, 1970 and June 30, 1971 are shown for comparative purposes. Figures are rounded where necessary for simplicity of presentation.

	June 30, 1970	June 30, 1971
(1) Membership		
Active Members	651	711
Deferred Annuitants	15	14
Retired Members	116	123
Disabled Members	1	1
Widows of Deceased Members	51	51
Children of Deceased Members	36	32
(2) Payroll and Annuities Payable	(Thousands of Dollars)	
Total Payroll	$ 6,551	$ 7,331
Annuities (annual)	389	425
(3) Valuation Balance Sheet	(Thousands of Dollars)	
Accrued Liability	$ 20,588 *	$ 21,399
Assets	9,099	10,994
Unfunded Accrued Liability (Deficit)	$ 11,489	$ 10,405
Funding Ratio (Assets/Accrued Liability)	44.2% *	51.4%

* Corrected.

(4) Normal Cost and Funding Costs

	June 30, 1970 % of Payroll	June 30, 1971 % of Payroll
Normal Cost	13.69%	13.28%
Administrative Expense	.09	.09
Normal Cost plus Expense	13.78%	13.37%
Normal Cost plus Expense	13.78%	13.37%
Interest on Deficit	6.14 *	4.98
Total (Minimum Contribution)	19.92%	18.35%
Normal Cost plus Expense	13.78%	13.37%
Amortization by 1997	9.80 *	8.14
Total (Required Contribution)	23.58%	21.51%

* Corrected.

(5) Statutory Contributions

Employee	7.0%	7.0%
Employee Regular	11.2	11.2
Employer Additional	8.0	8.0
Total Contributions	26.2%	26.2%

(6) Investment Yield *

	4.14%	6.75%

* Rate of return on mean assets excluding Minnesota Adjustible Fixed Benefit Fund.

2. Discussion of Valuation Results

The normal cost as a percentage of payroll declined from 13.69% of payroll in 1970 to 13.28% in 1971. This was the result of hiring 75 new entrants with an average entry age below that of the group.

The excess of the statutory contribution over the required contribution has resulted in a faster rate of amortizing the deficit than anticipated. Thus, a large decline in the amortization contribution occurred during the year. This decline was accelerated by the large number of new entrants who add to the payroll but who do not create any deficit.

Part of the decline in the amortization comes from substantially larger investment earnings during the year. In dollars, these earnings increased from $267,855 in fiscal 1970 to $427,594 in fiscal 1971; as indicated above, the change in the rate of return was from 4.14% to 6.75%. This area of the financial report has been questioned. We surmise that insufficient interest accruals were reported as of June 30, 1970 which would produce an understatement of the investment income for fiscal 1970 and an overstatement for fiscal 1971.

The unfunded accrued liability declined from $11,489,415 to $10,405,457 during the year, a decrease of $1,083,958. The following is an approximate analysis of this change:

Decreases:		
Amortization Contribution	$ 568,959	
Excess Interest	205,937	
Capital Gain	40,412	
Mortality and Termination Gain	122,325	
Continued Service of Older Members (SPO)	76,122	
Other Actuarial Gains	183,651	
		$ 1,197,406
Increases:		
Salary Scale Loss		113,448
		$ 1,083,958

3. Conclusion

In our opinion, the statutory contributions for this plan are sufficient to pay the normal cost each year and to retire the deficit by 1997. This opinion is based upon cost figures obtained by the entry age normal cost method and upon the valuation assumptions.

Franklin C. Smith
Associate, Society of Actuaries
GEORGE V. STENNES AND ASSOCIATES
Commission Actuaries

GVS Minnesota Memorandum No. 71-10
January 21, 1972

HIGHWAY PATROLMEN VALUATION AS OF JUNE 30, 1971
SUPPLEMENTAL REPORT

After the valuation report had been submitted and a review made at the Commission meeting on December 10, 1971 (see GVS Minnesota Memorandum No. 71-5), we realized that 1971 was the year for a quadrennial survey studying the actual experience compared with the actuarial assumptions.

The annual valuation reports show the rate of return on investments and the changes in the salary picture, and they follow the average retirement age year by year. Therefore, additional study of these items is not needed, and this Supplemental Report will be confined to death rates, withdrawal rates and rates of disablement.

The study covers the period from July 1, 1967 to June 30, 1971. However, since the State Police Officers Fund was not merged with the Highway Patrol Fund until July 1, 1969, data from the State Police Officers are included for only the last two years of the four-year period.

The data for the active lives of the Highway Patrol group showed 1,672 man-years of life and for the active lives of the State Police Officers group 380 man-years. Thus, the total was only 2,052 man-years which is a small number to use as the basis for a study.

The study of experience among retired lives was based on a total of 372 man-years divided 281 for the Highway Patrol and 91 for the State Police Officers. Corresponding data for the widows totaled 134 man-years divided 81 for the Highway Patrol and 53 for the State Police Officers. Again, these are relatively small numbers.

Separate results will be presented for the Highway Patrol for the four-year period and for the State Police Officers for the two-year period as well as the combined results.

Active Lives

	Highway Patrol			State Police Officers		
	Expected	Actual	A/E	Expected	Actual	A/E
Mortality	7.31	5	68.4%	2.92	0	0.0%
Termination	19.47	21	107.9	3.03	11	363.0
Mortality and Termination	26.78	26	97.1	5.95	11	184.9
Disablement	3.98	1	25.1	1.65	0	0.0

Lives Receiving Benefits

	Highway Patrol			State Police Officers		
	Expected	Actual	A/E	Expected	Actual	A/E
Retired	9.25	7	75.7%	5.25	3	57.1%
Widows	1.24	1	80.6	1.70	4	235.3

Combined

	Active Lives				Receiving Benefits		
	Expected	Actual	A/E		Expected	Actual	A/E
Mortality	10.23	5	48.9%	Retired	14.50	10	69.0%
Termination	22.50	32	142.2	Widows	2.94	5	200.7
Mortality and Termination	32.73	37	113.0				
Disablement	5.63	1	17.8				

The above results point to a mortality assumption which is not sufficiently conservative. The margin in the withdrawal assumption and the disability experience have offset this among active lives.

However, among those receiving benefits, the only offsetting element has been the mortality experience among widows. One other important fact is the small number of man-years in the base, and only a small increase in the number of deaths would have produced a ratio close to 100%.

It is recommended that the mortality experience be reviewed again on the July 1, 1972 anniversary by updating the above data and that a more conservative assumption be adopted at that time if the results point to such a change.

Franklin C. Smith
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Consulting Actuaries

GVS Minnesota Memorandum No. 71-10
January 21, 1972

HIGHWAY PATROLMEN VALUATION AS OF JUNE 30, 1971
SUPPLEMENTAL REPORT

After the valuation report had been submitted and a review made at the Commission meeting on December 10, 1971 (see GVS Minnesota Memorandum No. 71-5), we realized that 1971 was the year for a quadrennial survey studying the actual experience compared with the actuarial assumptions.

The annual valuation reports show the rate of return on investments and the changes in the salary picture, and they follow the average retirement age year by year. Therefore, additional study of these items is not needed, and this Supplemental Report will be confined to death rates, withdrawal rates and rates of disablement.

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Lives Receiving Benefits

	Highway Patrol			State Police Officers		
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Retired	9.25	7	75.7%	5.25	3	57.1%
Widows	1.24	1	80.6	1.70	4	235.3

Combined

	Active Lives		
	Expected	Actual	A/E
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However, among those receiving benefits, the only offsetting element has been the mortality experience among widows. One other important fact is the small number of man-years in the base, and only a small increase in the number of deaths would have produced a ratio close to 100%.

It is recommended that the mortality experience be reviewed again on the July 1, 1972 anniversary by updating the above data and that a more conservative assumption be adopted at that time if the results point to such a change.

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