

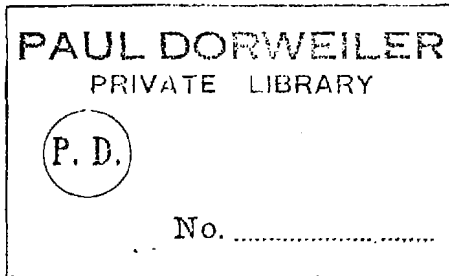
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**"Thought constitutes the greatness of man."  
*Pascal***

# PROCEEDINGS

November 19, 1948

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## MORE CASUALTY ACTUARIES ARE NEEDED

PRESIDENTIAL ADDRESS BY J. M. CAHILL

For years prior to December 7, 1941, this country remained oblivious of and grievously unprepared for what was ahead. Let us hope that our government is not repeating the same mistake today in the face of obvious dangers. I wonder, however, if we are not face to face with a somewhat analogous situation in the casualty insurance business where we neither have nor are training enough technical experts to cope with the current situation and the ratemaking problems ahead.

Following the SEUA decision in 1944, there was the tremendous task of drafting appropriate legislation throughout the country to continue state regulation of the insurance business. This was largely handled by lawyers in the industry and by insurance department officials. The work of lawyers will not diminish for years to come because there unquestionably will be the flood of litigation predicted by the late Chief Justice Stone in his minority opinion at the time of the SEUA decision.

The rate regulatory statutes have largely been enacted, however, and the problem of functioning thereunder now devolves primarily on ratemaking experts. Whereas even ten years ago casualty actuaries were considered an unnecessary luxury in most companies, today they are a necessity, not only in rating organizations and companies that make their own independent filings, but also in other companies with any substantial premium volume and in insurance departments. Under the newly enacted rate regulatory statutes, whether of the prior approval, subsequent disapproval or other type, the insurance departments have the obligation of ascertaining that the rate filings in effect produce results that are not in conflict with the requirements of the statutes. This analysis work can best be performed by individuals with an adequate knowledge of ratemaking principles and methods. Actual experience has demonstrated that this is a field for casualty actuaries.

It may be worthwhile to explain more specifically the changes in the ratemaking situation in the casualty insurance business which have occurred in recent years. Prior to the enactment in the years since 1944 of rate regulatory statutes which now apply for all kinds of casualty insurance in all states and territories except three — Idaho, Oklahoma and West Virginia — there were few states that regulated the rates for casualty insurance other

than workmen's compensation insurance. This meant, then, that the companies were very much on their own so far as ratemaking procedures were concerned, and judgment could be freely exercised to whatever extent was deemed desirable in establishing either manual rates or adjusted rates for individual risks. Although there was a keen competitive market, chaotic conditions did not result because a number of rating organizations had been established by some of the leading companies on a voluntary association basis. This did not constitute any monopoly situation because the premium volume written by the companies that were members of such bureaus represented, in most instances, only a minority of the total premium volume for the particular kind of insurance.

With the enactment of rate regulatory laws, rate filings with the state supervisory authorities together with supporting information therefor are generally required. The ratemaking standards of the statutes must be met through the use of rating procedures submitted to and accepted by the supervisory authorities. Judgment cannot be freely exercised as in the past but, instead, an equally satisfactory rating result must be achieved through the use of the more standardized procedures established for this purpose.

It is generally provided in rate regulatory statutes that rates shall not be excessive, inadequate or unfairly discriminatory. The manner in which such rates shall be determined is not specifically prescribed but, instead, the various factors which shall be taken into account are outlined. For example, in the All Industry Bill the following are listed:

*"Due consideration shall be given to past and prospective loss experience within and outside this state, to catastrophe hazards, if any, to a reasonable margin for underwriting profit and contingencies, to dividends, savings or unabsorbed premium deposits allowed or returned by insurers to their policyholders, members or subscribers, to past and prospective expenses both countrywide and those specially applicable to this state, and to all other relevant factors within and outside this state."*

In addition, provision is made for permissible variation in expense provisions between insurers or groups of insurers, for the establishment of classification rates and minimum premiums, and for rating plans reflecting variations in hazards or expense provisions. Most statutes state that uniformity of rates among insurers is neither required nor prohibited.

To supply the trained technical talent needed to think out and develop sound, up-to-date rating methods and to provide the insurance departments with the rating experts they require to make the proper review of filings will be a formidable task, but one which must be faced now and not at some indefinite date in the future. Now is the time to direct the attention of company and rating organization executives to the fact that capable young men and women should be hired for training as casualty actuaries and that these professional people should be encouraged to make rapid progress and be rewarded accordingly. Only by getting such an apprenticeship program promptly under way can the casualty insurance industry hope to cope with the practical situation facing it in the years immediately ahead.

Addition of such personnel will not necessarily mean an increase in operating costs. Technicians by nature can figure out ways of accomplishing results in a simpler and more straightforward manner, thus reducing expenses. The high clerical costs of today make it more essential than ever to simplify and mechanize operations in the insurance business if the companies are to be able to operate on the present expense percentages which were established in prewar days before inflation raised havoc with both loss and expense costs.

The following are only a few of many matters that need attention in the casualty insurance business. It would be extremely helpful from every standpoint if there were available a sufficient number of experienced casualty actuaries and statisticians to thoroughly investigate and analyze these problems so as to bring about improvements. The casualty insurance business is a dynamic one, subject to rapid changes in conditions and demands, and it must keep abreast of the times with desirable changes if the needs of the insurance buying public are to be met.

- (a) Statistical plans and compilation methods which will furnish all essential statistics for ratemaking and analysis purposes without either unnecessary detail, heavy expense or delay.
- (b) Manual ratemaking methods.
- (c) Loss ratio studies by size of risk.
- (d) Expense studies by size of risk for the purpose of developing and supporting expense constants and gradation of expense by size of risk where such are justified.
- (e) Studies leading to more accurate methods of applying expense loadings. For example, possibly in workmen's compensation ratemaking more accurate rates would be produced if a portion of the expense loading were a function of the payroll exposure.
- (f) The development of adequate systems of rating plans which will produce more accurate rates and premiums for eligible risks through merit rating.
- (g) Constant attention to operating practices to keep procedures on as simple and non-costly a basis as possible through mechanization and other means.
- (h) The development and rating of broader policy provisions of the comprehensive all-risk type.
- (i) Modernization of the annual statement blank.
- (j) Methods of compiling accurate loss reserves for both solvency and ratemaking purposes.
- (k) Studies of excess limits tables.

The ratemaking and operating methods in the casualty insurance business are not perfect by any means, but progress has steadily been made and it is certain that the casualty insurance industry would not be so far along

and so successful except for its casualty actuaries. More of them are needed to cope with the present volume of work, to solve present and future problems, and to supply new fields that will have a demand for technicians. In addition to the present demand for actuarial talent within the casualty insurance industry and from insurance departments, there are signs of some interest on the part of the fire insurance industry in acquiring the services of ratemaking experts with experience in the casualty insurance field.

I hope that all of you have read that entertaining book "Slightly Perfect" about the escapades of a life insurance actuary which was written some years ago by George Malcolm-Smith whom I knew in college and later at the Travelers. If you have not read the book, you may have seen either the musical comedy or the movie "Are You With It" based on the book. Although both the story and the leading character are wonderful, I must state that he and his antics are not representative of the people who are casualty actuaries. To be a successful casualty actuary requires knowledge of mathematical and statistical methods, but one does not need to be a mathematical genius. The ideal qualifications for a potential casualty actuary are a good working knowledge of mathematics, common sense, the ability to meet people easily, and the ability to explain complicated matters clearly and simply. It must be second nature to understand facts and figures because such data provide the foundation for the ratemaking that the casualty actuary does.

Up to this point, I have tried to call attention to the great need for augmenting the number of actuaries in the casualty insurance business and to cite fields where much worthwhile work can be done by such technicians for the permanent good of the business. It might be well to comment also on why young people should be interested in entering this field. There is no question but that there is a world of opportunity ahead for those who are capable, ambitious and aggressive. The casualty insurance premium volume is increasing steadily and rapidly, and there are many unexplored areas of coverages which will become important when developed. The present executives in the business are overburdened with work and will welcome the younger men who show the ability to take over and handle important duties satisfactorily. There is no desire on the part of executives to retard the young people coming along but, instead, there is a great need for capable, thorough workers who can produce a finished product and not merely assemble the ingredients for final decision by someone else.

One of the ways in which a considerable knowledge of the business, together with some prestige, can be quickly acquired is by passing the examinations of this Society and becoming first an Associate and then a Fellow. All of the younger people in the actuarial departments of companies and of rating organizations, or who are engaged in reviewing rate filings in insurance departments, should be interested in and encouraged to try to become members of this Society. Those who succeed in passing the examinations will get a competitive jump on fellow employees in their field and will have the opportunity to become the casualty insurance executives of the future.



With increasing frequency, I, and undoubtedly others, am asked for the names of casualty actuaries who might be available to accept important positions in the industry. It is embarrassing indeed not to be able to respond to such inquiries in an adequate manner. Years ago, there always were young Fellows and Associates who would have been available for this purpose, and they would have jumped at opportunities such as those which now almost go begging. It is no exaggeration to say that we are in a bull market for casualty actuaries. The supply must be brought into balance with the demand as promptly as possible to avoid serious consequences in the insurance business.

Please do your part by encouraging young people to enter this field and to become members of this Society as evidence that they have the ability to move ahead. To help accomplish this objective, the Council of the Society recently authorized the appointment of a Committee on Development to which the following members have been appointed:

Harry V. Williams (Chairman)  
John W. Carleton  
Clarence A. Kulp  
Sydney D. Pinney  
Seymour E. Smith

This Committee will welcome, I am sure, your suggestions as to ways and means of increasing as quickly as possible the number of qualified casualty actuaries in this country.

## NEW YORK COMPENSATION RATE MAKING

BY

ROGER A. JOHNSON JR.

At the November 1939 meeting, a paper entitled "The Practice of Workmen's Compensation Rate Making as Illustrated by the 1939 Revision of New York Rates" was presented by Mr. C. M. Graham. In 1940, the writer presented a short paper discussing changes which had taken place in the 1940 revision.

Since that time a lot of water has passed over the dam and the present rate making procedure, particularly with the 1948 changes, is rather different. It would seem timely to bring things up to date.

## I. 1941 to 1946

From 1941 to 1946, the New York Compensation rates were revised annually to reflect (1) the experience of the latest composite policy year, (2) law amendments passed by the New York Legislature, (3) increases in the Workmen's Compensation Board assessment factor, and (4) exclusion of the Security Funds factor in 1944 because the stock Security Fund had reached its statutory requirement.

A. *Revised Rate Making Procedure*

Late in 1943, the subject of revising the rate making procedure to minimize the results of the abnormal experience due to war contracts, the dislocations of industry due to wartime activity, and the shortage of trained personnel in the offices of the carriers, had been under discussion in the National Council on Compensation Insurance as well as in the Compensation Insurance Rating Board. The National Council forwarded a proposal to revise the determination of classification rates, stating that it was necessitated by the following considerations:

- (1) The fact that the then present rate making procedures were not sufficiently responsive to the great difference between conditions being encountered and those reflected in the experience which normally would have been used.
- (2) The difficulties encountered by carriers and rating organizations in maintaining a complete statistical program.
- (3) The unsatisfactory manner in which the contingency loading program was operating.

The following revised rate making procedure, corresponding to the National Council proposal except for amendments to reflect New York Conditions, was adopted to become effective with the July 1, 1944 rate revision:

- (1) Determine the rate level from the latest composite year July to June. (No change.)

(2) Discontinue the National Council Premium and Loss Exhibit, industry group rate levels, and projection factors.

(3) Compile the classification experience exhibits using the two latest available policy years of experience. (1940 and 1941 at the 1944 rate revision.) Modify actual incurred losses only by law amendment and development factors, and adjust medical losses for ex-medical coverage.

Development factors from the preceding rate revision (based on a greater number of years of experience) were to be used, thus introducing stability and avoiding the erratic swings which had developed in the past under the National Council method of computing development factors.

(4) Formula rate against the underlying pure premiums without adjustment, using the National Council credibility criteria.

(5) Apply a final correction factor to the selected pure premiums in order to reproduce the adopted rate level.

(6) Discontinue the contingency factor program.

On the recommendation of the Classification and Rating Committee, a 20% limitation was imposed on the change of the selected pure premium from the underlying in order to avoid radical changes which might result from the substitution of a two year for a five year experience period.

#### B. *Minimum Premiums*

Effective July 1, 1942, the minimum premium procedure, which had been under attack for some time, was revised as follows:

(1) Except for certain special classifications, no minimum premium shall exceed \$100. (This particularly affected the contracting classifications.)

(2) The minimum premium corresponding to the governing classification shall be the minimum premium for the policy (instead of the average of the two highest classes shown in the policy).

Various suggestions for amending the minimum premium *formula* were studied, but no change therein was adopted.

#### C. *Elimination of Overtime Wages—Wartime Emergency*

Our entrance into the war brought about considerable increase in overtime labor and it was generally recognized that premium wages paid for overtime do not accurately measure the exposure. Since this seemed to be a national problem, a Special Committee on Overtime Wages was appointed by the National Council to study the subject.

After much study, this Committee reported that the best interests of the business required recognition of the situation and that reduction or elimination of overtime remuneration would stabilize future rate making as well as afford current relief.

In New York, after reflecting on the additional audit problems which

would be created by such a program, the Rating Board, in November 1943, filed a plan providing for excluding all wages earned in excess of normal rates of pay in the calculation of premium, provided the assured maintains books and records which show such overtime wages separately, both by individual employee and by classification. This proposal became effective January 1, 1944 as a wartime emergency measure but is still in effect.

#### D. *Payroll Limitation*

The question of the proper base for premium computation purposes is an old one and much has been said and written on the subject. It is generally conceded that a man-hour basis would most accurately measure the exposure to hazard, thus eliminating all questions of overtime, vacation, sickness, bonus or inflated wages, but the practical difficulties to be overcome in (1) determining man-hours on audit since few employers keep suitable records and (2) in converting our present rates and experience to a man-hour basis are, to all intents and purposes, insurmountable.

The payroll base, although more complicated in recent years by the elimination of overtime, has generally worked out well over a long period. There are, however, certain types of individuals, whose unusually high remuneration cannot be defended on any grounds as a true measure of the hazard involved. A specialty salesman, working on salary and commission totaling \$20,000 or more can hardly be considered a worse risk than another who ekes out \$52.50 a week in the same class of work. Each will receive \$32 per week compensation and unlimited medical when injured, yet the premium charge in one case would have been more than seven times as great.

One case, in particular, which came before the Classification and Rating Committee, served to point up this situation and bring about a measure of relief. A trainer of horses was employed by a well-known racing stable, his remuneration consisting of salary plus 10% of all purses won by his horses. The stable had a very successful season, winning more than \$500,000 in purses, so that the trainer's remuneration was nearly \$60,000. Since he was classified as #8280—"Racing Stables Operation" with a manual rate of about \$8.00, the premium on this one man amounted to nearly \$5,000.

Effective October 1, 1946, a proposal was adopted limiting payroll for premium computation purposes to an average of \$100 per week for the period covered. While this limitation has further complicated payroll audit problems, particularly in these inflationary times when \$100 a week salaries are not uncommon in many industries, it is generally felt that such a plan will operate for the best interests of the industry. Any attempt to reduce the limit to \$75, \$50 or the current effective wage (150% of the maximum weekly benefit) will so complicate payroll auditing as to create an intolerable situation.

#### E. *Specific Occupational Disease Rates*

At the July 1, 1943 rate revision, separate rates for specific occupational disease coverage were discontinued and losses incurred under Article 4-A of the New York Workmen's Compensation Law were included in the regular classification experience, but adjusted to the current maximum benefit level of such losses.

### F. *Special Disability Fund*

In 1945, the Legislature passed an act designed to encourage the employment of physically disabled persons, setting up a Special Disability Fund. When an employee who has a previous physical impairment (the courts have interpreted this to mean that the employer must have prior knowledge of it) is injured, and the disability is aggravated or increased because of the previous impairment, the carrier will pay compensation and medical in full, but may be reimbursed by the Fund for all payments after the first 104 weeks. The 104 week figure is purely arbitrary and is designed to avoid any necessity for proving how much of any disability is due to the previous impairment and how much to the subsequent injury. The Fund was established by assessing all carriers and self-insurers 1% of their compensation loss payments during the first year, and is maintained by annual assessments of the amounts paid out of the Fund, on the same basis. (Currently, this assessment amounts to about 0.2% of paid compensation losses.)

Question arose as to how such cases would be treated in rate making. It was readily determined that only the first 104 weeks would be included in classification rate making, experience and retrospective rating in order not to penalize the individual assured or classification of risks which employs disabled persons in accordance with the intent of the Law. The balance over 104 weeks must, however, be included somehow in the overall rate level so that the carriers can pay the assessments. It was decided to include all cases at full cost in the experience underlying the rate level in order to provide the carriers with sufficient funds at the time the cases are incurred to meet subsequent assessments as they fall due. Since many cases are not recognizable as Special Disability Fund cases at the time of the first reporting, this method avoids doubling up when such cases are later determined to be Special Disability Fund cases and payments out of the Fund are made. Furthermore, it provides a more proper charge on the assureds who are liable for such cases. A new risk, entering the state ten years hence, will not be required to pay for the old cases, since they are currently reflected in the rate level shortly after they occur.

## II. 1947

### A. *Classification Relativity*

In the Report on Examination of the Compensation Insurance Rating Board made in 1945 (filed July 23, 1946), the Examiner outlined the then current method of determining classification relativities, and followed with these paragraphs:

"Although no provision is made in the . . . schedule for graduation of the credibility below 20%, in a number of classifications, particularly New York Special classes, a credibility of 10% was allowed in order to permit revision of the pure premium.

"It is the practice with some exceptions to continue the underlying pure premium for those classifications where the New York exposure is too small to warrant any credibility. As a result, in the 1944 revision, the continuance of underlying pure premiums was indicated for approximately 235 classi-

fications, although departures from procedure were recommended and adopted for about 50 of such classes. If, however, the method of selection for the classes which do not warrant credibility, is continued year after year, many of such classifications will vary only with the average rate level even though the classification experience will have been favorable over a long period. In view of the use of only two years experience for classification relativity purposes, it is likely that a substantial number of classes will not be eligible for credibility.

"It is suggested that for such classifications either a broader base be considered for credibility purposes or some recognition in revision be given to those classes which consistently produce a loss ratio below a certain level."

As a consequence of these and other recommendations, a joint subcommittee of the Actuarial and the Classification and Rating Committees was appointed. After considerable study, the following procedure was adopted and approved by the Superintendent of Insurance:

- (1) Extend the present tables of credibility downward to provide for 10% credibility.
- (2) Allow a minimum credibility of 5% for any partial pure premium which does not qualify for 10% credibility.

#### B. *Rate Filings Disapproved*

Subsequent to this action, the rate revision was prepared and filed otherwise in the same manner as in previous years. Although there were no 1947 law amendments affecting the cost of compensation (except S.O.D.), increases had been approved effective June 1 in lines 49-54 of the Minimum Medical Fee Schedule, and a new hospital agreement had increased the daily rate for hospital care effective January 1, 1947. The discontinuance of cash discounts on large medical bills also increased medical costs. These changes, estimated to increase medical losses by 16.5%, were treated in the same manner as law amendments. 16.5% of medical was equivalent to 4% of total losses.

The adopted rate level was, by coincidence, an increase of 4%, as follows:

$$.985 \times 1.040 \times 1.013 \times 1.002 = 1.040$$

where: .985 was the indicated change from experience alone

1.040 was the medical "law amendment" (1.165 on medical losses)

1.013 was the Security Funds Factor (reintroduced)

1.002 was the estimated effect of the S.O.D. law amendment

A separate filing was made, requesting a 4% increase on outstanding business June 1, 1947 to reflect the medical "law amendment."

Two Department Examiners were directed to examine both filings and the result of their examination was a memorandum recommending disapproval of both filings and attacking practically every element of the revision:

### 1. *Revisions in Medical Fee Schedule and Hospital Per Diem Schedule*

In order to estimate the cost of these changes, the Board had collected data from seven carriers (members of the Medical and Claims Committee) on medical payments made during a given month. Although this was the only material available on the subject, and had been collected without bias, the Examiner criticized the data from every angle, with particular emphasis on the fact that there was considerable variation between carriers reporting. Admittedly, the study, which covered payments in some 18,000 cases, was a relatively small sample, but the Rating Board felt that it was the best available method of estimating the increased costs.

### 2. *Workmen's Compensation Board Assessment*

The Actuary of the Rating Board had estimated, based on the latest available data, that the assessment for the expenses of the Workmen's Compensation Board for the year ending March 31, 1947 would be 6.3%. The Examiner, using even later information, estimated 5.8%, and indicated the rate filing to be excessive by the amount of the difference.

The actual assessment, as levied by the Workmen's Compensation Board late in 1947, was 6.24% of paid compensation losses.

### 3. *Security Funds Factor*

Although the Department had not officially ruled whether payments would be required to be made to the Stock Security Fund beginning with the third quarter of 1947, information available to the Board indicated that such payments should be required, and the necessary factor was put into the rate structure.

The Examiner, estimating that that Fund would be only \$88,000 short of the statutory minimum (5% of outstanding losses) suggested that the Superintendent could waive the required payments, thus reducing the rate level by 1.3%.

The Law does not appear to permit the use of discretion, merely requiring payments when the Fund (as of any December 31) falls below 5% of the outstanding losses. As a matter of fact, although the rates including provision for the Security Funds Factor were disapproved, the stock carriers were required to make payments into the Fund for the year beginning July 1, 1947.

### 4. *Catastrophe Loading*

The Examiner criticized as excessive the current catastrophe loading of one cent in each manual rate. He quoted figures to show that the loss ratio in recent years has been about 15%. The current loading can be justified on the basis that in many cases it is less than the actual cost of catastrophe reinsurance. Furthermore, the loss ratio over a relatively short period is meaningless in view of such occurrences as the Texas City disaster, which, fortunately, happen only at great intervals.

### 5. *Development Factors*

The Examiner criticized the loss development factors produced by the Board program which will eventually encompass ten composite years of

experience. He pointed out the variation between stock and non-stock carriers, cited certain State Fund factors which were unusual, and pointed out that the Court of Appeals decision in applying the \$28 compensation rate to cases occurring prior to June 1, 1944 had affected the development factors for certain years.

Inasmuch as development indications for the latest policy years are generally higher than the adopted averages, the Board feels that the latter are conservative. Insofar as they reflect the actual experience of the various types of companies, they are valid and the indications should be used.

When the \$28 question was raised again in 1948, it was shown to the satisfaction of the Department that this decision had only a minimum effect on the development factors. Whatever effect it did have is justified as the only means available to the carriers for recouping some of the loss sustained as a result of the 1944 "retroactive" legislation.

#### 6. *Wage Changes*

A major portion of the Examiner's memorandum was devoted to a discussion of the increased wage levels and the failure of the Rating Board to recognize this factor in the rate filing.

Aside from the fact that no wage factor had been used in New York Compensation rate making in over twenty years and the Board had had no indication prior to making the filing that one was expected, there did not (and still does not) appear to be any practical method of making a proper adjustment.

It is apparent that the general wage level has increased, but it obviously has not increased equally in all industries, nor is it consistent within any particular industry in various sections of the state.

Even assuming that an accurate overall wage factor could be determined, there are many reasons why its use is not advisable. Such a factor, to be fair, must be applied whether wages are going up or down. A downward trend is extremely difficult to measure and its application would result in higher rates at the time of a depression. While desirable from the standpoint of the companies, it is likely that such a storm of protest would result that the factor would be speedily discarded. Furthermore, any wage factor inserts into the rate structure an element of guesswork or prognostication which is subject to criticism by supervisory authorities and by employers whose own particular wage rates have not followed the general trend.

Since rates made for a particular July 1 will be in effect on some policies nearly two years later, no one can predict the situation that far in advance. By that time, wages may have fallen considerably or may have risen out of sight. Rates are never claimed to be exactly right for the period they are in force, but always being keyed to the latest available experience, the overall picture over a number of years should produce the desired effect.

It should be noted that the Insurance Department, in its many suggestions for the 1948 revision, did not request a wage factor, as such,



but rather felt that the matter could be taken care of by a Rate Level Correction Factor.

After a statutory hearing before Deputy Superintendent Martineau, at which the Rating Board presented a brief in defense of its filings, a "no opinion" decision dated July 15, 1947 was issued which merely disapproved both filings. Since the Rating Board was not advised as to the grounds on which the filings had been disapproved the July 1, 1946 rates remained in effect. The 1946 rates for some 64 classifications were at least 15% inadequate on the basis of the 1947 classification experience, in view of the fact that the classification relativity was not brought up to date.

### C. *Silicosis and Other Dust Diseases*

Article 4-A of the New York Workmen's Compensation Law in 1936 had provided, among other things, for a maximum compensation of \$500 for cases occurring in June 1936, such maximum increasing by \$50 per month. Subsequent amendment continued the "escalator provision" up to a maximum of \$5,000 in December 1943. In 1944, an amendment provided for a new maximum of \$6,500 and in 1946, the maximum was increased to \$7,500.

In 1947, Article 4-A was repealed and silicosis and other dust diseases were included in the Law with unlimited compensation and medical. It was provided, however, that when disability and death occur after July 1, 1947, the carrier will be reimbursed by the Special Disability Fund for all payments in excess of the first 260 weeks. Where disability occurred prior to that date, but death occurred thereafter, the carrier's liability is limited to the first 104 weeks.

As in Special Disability Fund cases, such cases are included in the rate level at their full value, but limited in classification experience, experience rating and retrospective rating.

## III. 1948

### A. *Insurance Department*

Late in 1947, Mr. Arthur L. Bailey, a member of this Society, was appointed to the new position of Chief Actuary of the Insurance Department. The apparent purpose of this appointment was to enable the Department to maintain a closer contact with the technical committees of the Rating Board and to promote the mutual exchange of opinions prior to action being taken.

At an informal conference with the members of the Governing Committee and staff of the Rating Board, the Superintendent of Insurance indicated that it was his opinion that there were a number of hidden profits or "bones" in the rate structure which should be exhumed and replaced by a definite profit loading in the rates. Chief Actuary Bailey subsequently advised the Actuarial Committee as to the nature and location of the "bones" to which the Superintendent had referred. Some of these the Committee was able to justify, some were shown to have little or no effect and some required correction. Most of the 1948 changes in procedure were caused by the elimination of "bones" and the inclusion of profit loading. There were three major changes and a number of minor ones, as follows:

## B. Major Changes in Rate Making Procedure

### 1. Workmen's Compensation Board Assessment

As a factor applied to indemnity losses, this factor previously received the full expense loading. The Department felt that the loading should be limited to acquisition and taxes. The Actuarial Committee, while seeing the logic of this argument, felt that a dangerous precedent would be set by applying partial expense loadings rather than have expense as a function of the final rate. There are other elements here and elsewhere which might be similarly construed, which might lead to innumerable complications.

In the final analysis, however, the Governing Committee decided to concede this point in partial recognition of the inclusion of a profit loading. A reduced Workmen's Compensation Board factor was adopted, such that when the full loading was applied to it, the result was equivalent to the full factor loaded only for acquisition and taxes.

$$\frac{6.6\%}{.800} = \frac{4.8\%}{.585}$$

### 2. Profit Loading

This question soon resolved itself into two components—(a) Should there be a profit loading? (b) How much should it be?

The opponents of a profit loading felt that since Workmen's Compensation is a social insurance, required by law, it is not fitting to include a profit loading, as such, but rather to let a "profit incentive" be the reward for handling the business. It was stated that when the New York Compensation Law was passed in 1914, consideration had been given to a monopolistic state fund, but the private carriers had been allowed to enter the field on a non-profit basis.

The proponents, on the other hand, pointed out that the Superintendent of Insurance, to all intents and purposes, had instructed the Rating Board to include a profit loading in the 1948 rate filing. It was argued that the revised rating law gives the Superintendent a mandate that rates for workmen's compensation shall contain a "reasonable profit."

Consequently, on May 18, the Governing Committee adopted a "contingency or profit loading of 2.5 points." This would have increased rates by 4.3%.

$$\frac{.600}{.600-.025} = 1.043$$

On June 2, the Rating Board received a letter signed by Deputy Superintendent Martineau commenting on various phases of the rate revision. It was indicated therein that the Department felt that the 2.5 point loading was excessive and "suggested" a *profit provision* of 1.5 points, until such time as data could be produced which would justify this or some other figure. Although the Governing Committee still felt that 2.5 points was the proper figure, it was obvious that nothing higher than 1.5 points would be approved. Rather than jeopardize the entire filing, a "profit provision of 1.5 points" was adopted.

### 3. Rate Level Adjustment Factor

The National Council, cooperating with the N.A.I.C., had been studying the subject of a rate level adjustment factor which, based on recent calendar year experience, could be used to adjust rate levels not only to reflect current wages, but any other current conditions which differ materially from those in the experience period. The original program, as proposed by the National Council, called for determining the ratio of incurred losses to earned premiums for the two latest calendar years directly from the Casualty Experience Exhibits. This ratio would determine a factor to be applied to the rate level otherwise adopted.

At the December 1947 meeting of the N.A.I.C. in Miami, Deputy Superintendent Martineau read a memorandum outlining the following objections to this program, if applied in New York:

(1) The use of "net" premiums, thus including the effect of premium discount and retrospective rating.

(2) Failure to adjust premiums to the current rate level.

(3) Failure to recognize interest earnings on long-term cases.

The Actuarial Committee recognized the validity of (1) and revised the program to eliminate the effect of retrospective rating and premium discount by converting to a "standard premium" basis. Otherwise, it could be argued that the Factor is an attempt to retrieve a portion of the premium credits allowed under those plans. The Committee felt, however, that if the premiums were to be converted to the current rate level, the losses should also reflect the current loss level, but decided, in the interests of simplicity, to make no adjustment of this type. A test was made, however, which indicated a higher loss ratio on the adjusted basis.

In order to eliminate the effect of interest earnings on long term cases, the Committee limited the premiums earned and losses incurred in each calendar year to the latest four policy years in each case. For calendar years 1946 and 1947 on this basis, the premiums earned amounted to \$312,030,342 and the losses incurred to \$177,781,916, which is a loss ratio of 56.98%. The average permissible loss ratio, allowing for the Workmen's Compensation Board Factor, was 57.64%, so that the ratio of

$$\frac{56.98}{57.64} = .989$$

falls in the neutral zone, and a Rate Level Adjustment Factor of 1.000 was adopted.

In the subsequent approval of the rate filing, this factor was approved for this revision only, subject to further study by the N.A.I.C.

### C. Minor Changes

There were a number of minor changes in method suggested by the Insurance Department. In most cases the Rating Board felt that these changes constituted improvements and readily agreed to them:

#### 1. Pure Premium Correction Factors

It was suggested that separate pure premium correction factors for serious, non-serious and medical, keyed to the corresponding losses in

rate level, be used instead of a single factor. The Actuarial Committee adopted the suggestion, but later, because of the fact that the substantial 1948 law amendments had not been reflected in the underlying pure premiums, only separate factors for indemnity and medical were adopted for this revision.

### 2. Application of New Law Amendments in Rate Level Determination

The current procedure had been to determine a loss ratio exclusive of the latest law amendments, and separately determine the effect of the new law amendments. The product would then determine the rate level change.

It was pointed out that under this procedure the average law amendment factor was applied to this assessment, whereas it should only be affected by amendments to indemnity losses, and thus bias was introduced. While this bias could go in either direction, it seemed advisable to determine the loss ratio directly on the basis of losses adjusted to the latest level.

For example, in the 1947 revision, the rate level loss ratio prior to the Workmen's Compensation Board factor was:

$$\frac{\$ 71,541,892}{\$126,566,408} = 56.53\%$$

The Workmen's Compensation Board Assessment was 6.3% of the New York indemnity losses of \$51,592,306, or \$3,250,315.

$$\frac{71,541,892 + 3,250,315}{126,566,408} = 59.09\%$$

$$59.09 \div 60.00 = .985$$

$$.985 \times 1.042 \times 1.013 = 1.040 = \text{adopted rate level}$$

where: 1.042 was the 1947 law amendment factor

1.013 was the Security Funds Factor

Under the proposed method, with losses adjusted to the 1947 level, the figure of \$51,592,306 becomes \$51,730,706 and \$71,541,892 becomes \$74,532,649, and the result would have been:

$$\frac{74,532,649 + 3,259,034}{126,566,408} = 61.46\%$$

$$61.46 \div 60.00 = 1.024$$

$$1.024 \times 1.013 = 1.037$$

Since the 1947 law amendment was practically all applied to medical losses, the rate level was too high by .3%. Normally, however, with law amendments on indemnity losses, it would be too low.

### 3. Pure Premium Limitation

The normal pure premium selection program calls for limiting the change in total pure premium to 20% from the underlying. Because

the 1947 rate revision had been disapproved, there were considerably more classifications in 1948 where the formula pure premium indicated a change of more than 20% (mostly upward). In order to overcome this difficulty, the Insurance Department suggested the following method of permitting changes of more than 20% under certain conditions:

The selected pure premium shall be limited to 20% change unless the indications of each of the two policy years represent a change of more than 20% in the same direction, in which case:

(1) the formula pure premium shall be selected if it lies between the underlying pure premium and the nearest (to the underlying) of the policy year indications.

(2) the nearest (to the underlying) of the policy year indications shall be selected if the formula lies between the two policy year indications.

This procedure worked very well at the 1948 revision, permitting changes of more than 20% where a definite trend was indicated. Although there should be less necessity for such a rule in future years, it could well be continued as a permanent part of the rate making program.

#### D. *No Change Adopted*

On two points raised by the Insurance Department, the Rating Board, after considerable study and analysis, was able to convince the Department that no change was necessary.

##### 1. *Development Factors*

Question was raised as to whether the decision of the Court of Appeals applying the \$28 compensation rate to cases occurring prior to June 1, 1944 had not increased the development factors for policy years 1941 to 1944 out of line with expected conditions for the future.

It was pointed out (a) that the third reporting of many such cases had been filed prior to this decision, and thus had no effect on the development factors, and (b) in no case was more than three years of compensation (June 1, 1944—June 30, 1947) reported at the \$28 rate, which is a maximum increase of \$468 per case.

##### 2. *Interest Earnings*

In the rate making formula "Premium = Losses + Expenses," the loss element is valued as of 42 months (third reporting) while the other elements are valued as of some time during the policy year. The Insurance Department felt that this represents a substantial provision for profit which should be eliminated and replaced by a specific loading in the rates. The following example was presented in support of the contention:

		Average	Discount
		Years After Effective Date	(1) × 2%
		(1)	(2)
Assumed incurred losses as of 42 months . . . . .	\$1,000,000		
First 12 months—amount paid or settled . . . . .	250,000	½	1%
Second 12 months—amount paid or settled . . . . .	150,000	1½	3%
Third 12 months—amount paid or settled . . . . .	150,000	2½	5%
Next 6 months—amount paid or settled . . . . .	50,000	3¼	6½%
Reserve as of 42 months . . . . .	400,000	3½	7%

Assumed premium collection = 6 months after policy inception  
 Assumed interest rate = 2%

A subcommittee of the Actuarial Committee was appointed to study this subject in every aspect and the following report of that subcommittee was transmitted to the Governing Committee and the Insurance Department and was the basis for no action being taken in the matter:

*Report of the Subcommittee on Interest Problems*

“The Subcommittee has devoted its attention to making an appraisal of probable interest earnings inherent in the conduct of the workmen’s compensation business in New York State.

“The problem was centered upon obtaining a parallel distribution of premium income and loss payments for typical carriers. The policy year experience seemed to be the only available basis for making a study of this character. Using this distribution as a basis for income and loss payments, and distributing the expense provisions on the basis of known or estimated incidence, net cumulative balances were ascertained for short intervals covering a 48-month history on a policy year’s operations. Separate calculations were made for each type of carrier to recognize differences in methods of operation. The accumulated balances were then converted to the equivalent period for which the full premium was available for investment. This analysis showed that for private carriers the equivalent period was slightly less than one year, and for the State Insurance Fund the equivalent period was somewhat more than one year for obvious reasons such as the retention of liability on all fatal cases and deferred dividends on special groups. These reasons motivated the Subcommittee to center its attention on the results for private carriers.

“It might be mentioned that the distribution of paid and outstanding losses at the end of 48 months showed a reasonable agreement with what may be anticipated in view of different methods of operation.

“The analysis to this point disregards the outstanding losses beyond 48 months, the approximate equivalent of third reportings under the Unit Statistical Plan. From the figures available it is estimated that the unpaid losses as of 48 months amount to 12% of premiums, of which approximately one-third or more are reserved on a tabular basis at an interest rate of about 2½%. To the extent that private carriers are earning less than 2½% net effective interest, these cases are creating an interest deficiency. The nature of the residual cases is such that they will be liquidated within a

relatively short interval and the Subcommittee estimates that these cases may add 0.1 to 0.2 years to the equivalent period previously estimated at slightly less than a year. The interest deficiency on the tabular cases mentioned above offsets in part or in total this indicated increment.

"In the judgment of the Subcommittee the complete estimate of the equivalent period of time would not be more than 1.1 years.

"Proceeding from this point, the Subcommittee discussed at great length various concepts of interest rates as related to the present problem, as follows:

1. In any quantitative appraisal of the equivalent period determined by the Subcommittee's analysis, the interest rate should reflect opportunities for investment in the present and immediate future rather than be based upon past experience. This point is particularly cogent with regard to carriers newly entering the compensation field.
2. In actual practice, only a portion of available monies can be put into productive investments immediately.
3. In the interest of public policy it would be unwise to motivate insurance carriers to meet a predetermined interest requirement. Up to the present, casualty companies' investment policy has been a prerogative of management.
4. In the past, company results have differed to a considerable extent. For example, a brief review of 1946 interest earnings in relation to investable assets of members of the Compensation Insurance Rating Board shows a range from 1.1% to 3.3% with a concentration around 2.0% to 2.5% before Federal taxes to which, of course, all private carriers are subject. These figures are influenced to some extent by investments made under more favorable conditions than exist at present as well as differences in investment policy.

"In conclusion, in the opinion of the Subcommittee the interest earnings expressed as a percentage of New York State compensation premiums may be estimated for an individual carrier from the following table:

Yield on Investable Assets Before Federal Taxes	After Federal Taxes	Assumed Maximum Equivalent Period	Percentage of Premium
1.0	0.6	1.1	0.7
1.5	0.9	1.1	1.0
2.0	1.2	1.1	1.3
2.5	1.5	1.1	1.7
3.0	1.8	1.1	2.0

#### E. 1948 Rate Revision

##### 1. Rate Level

The 1948 adopted rate level change was an increase of 6.3%, which can be analyzed as follows:

$$1.032 \times 1.013 \times 1.026 \times 1.000 \times .990 = 1.063$$

In explanation:

1.032 is the experience indication with losses on the 1948 law level. Since the 1947 and 1948 law amendments amounted to 1.042 and 1.096 respectively, the pure experience change from 1946 (present) was

$$\frac{1.032}{1.042 \times 1.096} = .904, \text{ or a decrease of } 9.6\%.$$

1.013 is the Security Funds Factor.

1.026 is the effect of incorporating a profit provision of 1.5 points in the rate structure  $\frac{.600}{.600-.015} = 1.026$

1.000 is the adopted Rate Level Adjustment Factor.

.990 is the net effect of increasing the Workmen's Compensation Board Factor from 1.063 to 1.066, but loading it only for acquisition and taxes.

### 2. Average Expense Provisions

The following distribution of the average expense provisions results from the adoption of a profit provision of 1.5 points and the inclusion of the Workmen's Compensation Board Factor and Security Funds Factor in the rate structure: (See appendix #1)

	In Standard Rates (excl. Loss & Premium	In Printed Manual Rates (excl. Loss & Expense Constants)
Acquisition . . . . .	17.5%	17.5%
Taxes . . . . .	2.5	2.5
Claim Adjustment . . . . .	7.6	7.7
Inspection . . . . .	2.4	2.4
H.O. Administration . . . . .	7.2	6.9
Payroll Audit . . . . .	1.9	1.6
Profit Provision . . . . .	1.4	1.4
Sub-total . . . . .	40.5	40.0
Security Funds . . . . .	1.0	1.0
Workmen's Compensation Assessment . . . . .	2.6*	2.6*
Loss Provision . . . . .	55.9	56.4
Total . . . . .	100.0	100.0

\*Actually applied as 4.8% of indemnity losses, with full loading thereon.

### 3. Loss and Expense Constants

Although there has been no basic change in the calculation of loss and expense constants and offsetting adjustment factors, the formulae have been simplified and, in order to produce stability, the loss ratio differential is now determined from ten years of experience. The formulae used in these calculations are given in the Appendix of this paper.

The following loss and expense constants and offsetting adjustment factors for loss constants and the off-balance of the Experience Rating Plan were adopted at the 1948 revision:



Industry Group	Loss Constant	Expense Constant	Offsetting Adjustment Factor
Manufacturing . . . . .	\$ 8	\$5	1.028
Contracting . . . . .	26	5	1.015
Federal . . . . .	26	5	1.000
Servants P.C. . . . .	0	5	1.000
Window Cleaning . . . . .	0	5	1.000
All Other . . . . .	8	5	1.016

Obviously, the expense constant is 100% for expenses. Question was raised as to how much the loss constants had been loaded for expenses. It was determined that the loss element in the loss constant had been loaded for all expenses except Administration and Payroll Audit by the application of a factor of .564 to the indicated loss constants on a full

$$\frac{.564 + .085}{.564 + .085}$$

premium basis. Thus 64.9% of the final loss constant is a loss element and 35.1% for expenses other than Administration and Payroll Audit.

$$.564 + .085 = .649$$

$$1.000 - .649 = .351$$

4. *Pure Premium Correction Factors*

It was determined that correction factors of .9721 for indemnity and .9774 for medical were necessary to be applied to the selected pure premiums in order to reproduce the desired rate level. These calculations, made under a revised procedure suggested by the Insurance Department, failed to include the effect of the premium development factor on the pure premiums, with the result that the factors, and the rates resulting therefrom, were too high by 0.2%. The product of these correction factors, the Workmen's Compensation Board factor on New York indemnity losses, the Security Funds factor, the expense loading and the offsetting adjustment factors determined above, produced the final factors which, applied to the selected pure premiums, resulted in the 7/1/48 printed manual rates (less the catastrophe loading):

	Indemnity	Medical
Manufacturing . . . . .	1.798	1.753
Contracting . . . . .	1.776	1.730
Federal { New York . . . . .	1.749	1.705
{ United States . . . . .	1.669	1.705
Servants P.C. . . . .	1.749	1.705
Code No. 9170 . . . . .	1.749	1.705
All Other . . . . .	1.778	1.732

For example,  $.9721 \times 1.028 \times 1.048 \times 1.695 \times 1.013 = 1.798$

- where .9721 is the indemnity pure premium correction factor
- 1.028 is the manufacturing offsetting adjustment factor
- 1.048 is the Workmen's Compensation Board factor
- 1.695 is the expense loading  $\frac{1.0}{.605 - .015}$
- 1.013 is the Security Funds factor

For Code #2501, the following pure premiums had been selected by the Classification & Rating Committee:

$$\begin{aligned} &\text{Serious } .06, \text{ Non-Serious } .16, \text{ Medical } .10. \\ &(.06 + .16)1.798 + (.10)1.753 + .01 = \$3.58 \\ &\text{which is the } 7/1/48 \text{ manual rate.} \end{aligned}$$

#### F. *Minimum Premium Formula*

The 1945 Report on Examination of the Compensation Insurance Rating Board cited above recommended modification of the minimum premium formula to recognize the favorable loss ratios of recent policy year experience.

The Subcommittee which had studied the subject of pure premium selection also undertook a thorough analysis of the minimum premium formula. It was early recognized that the permissible loss ratio for minimum premium risks should be lower than 60%, but no successful attempt to determine it exactly was made.

After studying this subject for more than a year, a majority report of the Subcommittee recommended no change in the present formula for the following reasons:

"1. Since approximately the same redundancy appears in the loss provision for both minimum premium and non-minimum premium risks under \$500, it is likely that the situation will be corrected by the 1948 rate level and calculation of revised loss and expense constants.

2. Even though the loss provision appears to be somewhat redundant, there is no evidence as to whether the expense provision in the minimum premium formula is adequate. Since the Insurance Department is now engaged in making a study of this element, the Committee felt justified in waiting to see whether the expense provision is adequate or inadequate."

Concurrently, a minority report, filed by a member of the Subcommittee, recommended changing the minimum premium formula to ten times the manual rate plus loss and expense constant. This report pointed out the lower formula in effect in most other states, and criticized the majority report for attempting to maintain the "status quo" in the face of evidence indicating that a reduction in the formula was justified.

The Actuarial Committee, a tie vote being broken by the General Manager of the Rating Board, voted to revise the minimum premium formula to ten times the manual rate plus loss and expense constant effective July 1, 1948. Subsequently, the Classification and Rating Committee took similar action with regard to the minimum payroll for Code #9021—"Buildings," thus effectively reducing the minimum premium for that classification.

#### G. *Outstanding Rate Increase*

Because of the magnitude of the 1948 law amendments, effective July 1, 1948, it was deemed advisable to request adjustment of the rates on outstanding policies. In accordance with the program of the National

Council on Compensation Insurance, an increase equal to the combination of experience and law amendment (and also including provision for the Security Funds factor, since payments into the Stock Security Fund had been required beginning July 1, 1947) was requested. This amounted to 4.6%. As an expedient, it was decided that such increase would not apply to policies expiring prior to August 1, 1948.

This outstanding increase was approved, concurrent with the approval of the general rate revision, on June 28, 1948.

#### IV. *Conclusion*

Any attempt to cover eight years of progress in a field as large as this is bound to lead to omissions—some intentional and some unintentional. If the members and students of the Society are able to get a general picture of the developments that have taken place and the trend of current thinking, this effort will not have been in vain.

APPENDIX 1  
 WORKMEN'S COMPENSATION - N. Y.  
 CALCULATION OF STANDARD PREMIUM EXPENSE DISTRIBUTION

*July 1, 1948 Revision*

based on original premium of \$1,000,000

NEW YORK COMPENSATION RATE MAKING

Item (1)	Basic Loading (2)	(2) × 1,000,000 (3)	Security Fds Factor (a) (4)	W. C. Bd. Assessment (b) (5)	Total (3) + (4) + (5) (6)	Ratio to Total (7)
Acquisition	17.5%	175,000	2,215	6,091	183,306	17.5
Taxes	2.5	25,000	316	870	26,186	2.5
Claim Adjustment	8.0	80,000	—	—	80,000	7.6
Inspection	2.5	25,000	—	—	25,000	2.4
H. O. Administration	7.5	75,000	—	—	75,000	7.2
Payroll Audit	2.0	20,000	—	—	20,000	1.9
Profit Provision	1.5	15,000	—	—	15,000	1.4
Sub-total	41.5	415,000	2,531	6,961	424,492	40.5
Security Funds Tax	—	—	10,127	348	10,475	1.0
W. C. Bd. Assessment	—	—	—	27,495	27,495	2.6
Loss Provision	58.5	585,000	—	—	585,000	55.9
Total	100.0	1,000,000	12,658	34,804	1,047,462	100.0

(a)  $\frac{.01 \times 1,000,000}{1.00 - (.175 + .035)} = 12,658$

(b) W.C. Board factor of 6.6% of indemnity losses equals 4.7% of total losses.

$\frac{.047 \times 585,000}{1.00 - (.175 + .035)} = 34,804$

## APPENDIX 2

CALCULATION OF LOSS AND EXPENSE CONSTANTS AND OF  
OFFSETTING ADJUSTMENT FACTORS

$P_1$  – Full Premium at proposed rates – risks under \$500.

$P_2$  – Full Premium at proposed rates – risks over \$500.

$D_3$  – Adopted loss ratio differential for risks under \$500 vs. risks over \$500.

$$e = \frac{P_1 + P_2}{P_1 D_3 + P_2}$$

$a$  – offsetting adjustment in present rates.

$z$  – average credibility in experience rating.

$b$  – credit off-balance in experience rating.

$b_1$  – estimated credit off-balance eliminating effect of offsetting adjustment factor.

$$z(1-a) + ab$$

$k$  – proportion of premium for risks over \$500 subject to experience rating.

$a_2$  – indicated offsetting adjustment factor for revised rates.

$$\frac{e + kb_1 - kz}{1 - kz}$$

$b_2$  – expected credit off-balance for rated risks at revised rates.

$$z - (z-b)a/a_2$$

$N_1$  – number of risks under \$500.

$L$  – indicated loss constant.

$$\frac{.869 (1-e)P_2 + (1-a_2)P_1}{N_1}$$

$C$  – indicated loss and expense constant –  $L + \$5$ .

*Sources – at 1948 Rate Revision*

$P_1$  and  $P_2$  – policy year 1945 payrolls extended at selected pure premiums and adjusted to the adopted rate level and including the full expense loading.

$D_3$  – experience of policy years 1936-45.

$z$  and  $b$  – July 1, 1947 – June 30, 1948 experience rating statistics.

$k$  – special tabulation of policy year 1945.

$N_1$  – policy year 1945 risks experience.

## WORKMEN'S COMPENSATION D-RATIO REVISIONS

by

Arthur L. Bailey

D-ratios are the ratios of primary losses to total losses where the amount of primary loss corresponding to a specified total loss is as defined in the multi-split experience rating plan. The classification D-ratios are a very important element in the multi-split experience rating process and the experience modification, for a risk having appreciable credibility, is largely dependent upon the D-ratios. Thus it seems necessary that as much care be taken in the revision of classification D-ratios as in the revision of the rates to which such D-ratios are to be applied in the experience rating process. It is the purpose of this paper to present a method for the revision of D-ratios, which utilizes all of the data available and which is designed to produce as accurate D-ratios as possible.

Consideration has recently been given to the use of the primary-excess separation of losses in the revision of rates in lieu of the separation of losses by serious, non-serious and medical. If such a primary-excess separation of losses were to be used in revising rates, the revision of D-ratios might well become an important part of the process of revising rates. For example, if comparatively accurate classification D-ratios could be obtained, the rate revision process might be one whereby the primary pure premiums would be revised on the basis of the available primary loss experience and the total pure premiums would be the revised primary pure premiums divided by the revised D-ratios.

The present paper consists of a description of a process for revising D-ratios together with an appendix describing various functional D-ratios, one of which, based solely on the primary loss experience, is suggested for use in the revision of classification D-ratios.

There are available for the revision of classification D-ratios the following for each classification:

$D_u$  = the underlying D-ratio (namely the D-ratio used prior to the revision being made)

$D_f$  = the functional D-ratio indicated by the average primary loss in the experience to be used for the revision (see Appendix A for a complete description of this functional D-ratio)

$D_1$  = the D-ratio indicated by the experience to be used for the revision (namely the ratio of primary to total losses in such experience)

The first of these presumably summarizes all of the experience available in previous revisions. The second summarizes the indications of the primary losses of the current experience, the primary losses being those which are least subject to chance variation. The third summarizes the indications of all of the current experience including the excess losses which are subject to considerable chance fluctuations.

It is suggested that the revised D-ratios be determined from

$$\text{Revised D-Ratio} = D_r = Z_i D_i + Z_t D_t + (1 - Z_i - Z_t) D_u$$

Where  $Z_i$  and  $Z_t$  are credibilities to be determined with the understanding that  $Z_i + Z_t$  is not greater than unity. In other words, the indicated D-ratios will first be given such credibilities as they warrant, the D-ratios indicated by the primary loss portion of the experience will next be given such additional credibilities as they warrant, and the remaining credibilities will be given to the underlying D-ratios.

As the chance variation in  $D_i$  will be caused principally by the chance variation in the amount of excess losses, it would seem proper to give  $Z_i$  a value equal to the credibility applicable to the amount of excess loss when  $N$  losses have occurred. Such a credibility would be of the form:\*

$$Z_i = \frac{N}{N + K_e}$$

where  $N$  is the total number of losses and  $K_e$  is approximated from the excess loss classification experience and data as to the distribution of losses by size of loss.

The chance variation in  $D_t$  will be wholly the result of the chance variation in the amount of primary loss and it would seem proper to assign a value to the total of  $Z_i$  and  $Z_t$  equal to the credibility applicable to the amount of primary loss when  $N$  losses have occurred. Such a credibility would be:

$$Z_i + Z_t = \frac{N}{N + K_p}$$

where  $N$  is the total number of losses and where  $K_p$  is approximated from the primary loss classification experience and data as to the distribution of losses by size of loss.

In actual calculation it will be easier to calculate:

$$Z_u = 1 - Z_i - Z_t = \frac{K_p}{N + K_p}$$

and to obtain  $Z_t$  from  $Z_t = 1 - Z_i - Z_u$ .

On the basis of the Massachusetts D-ratios effective 12/31/45, the Massachusetts classification experience for policy years 1939 to 1943 inclusive, and the distribution of losses by size for policy years 1940 and 1941, the writer approximated the value of  $K_p$  as 47 and the value of  $K_e$  as 1344.

The entire process of revising the D-ratios using the above procedure is shown in Table I for certain of the Massachusetts classifications while Table II shows for each of the Massachusetts classifications the values of the manual D-ratios effective 12/31/45, the D-ratios indicated by the policy year 1939 to 1943 experience, the functional D-ratios based on the average primary loss in the same experience, and the D-ratios revised under the above procedure.

\* See "A Generalized Theory of Credibility", P.C.A.S. Vol. XXXII, p. 19.

**TABLE I**  
**REVISION OF D-RATIOS**  
**MASSACHUSETTS CLASSIFICATION EXPERIENCE FOR POLICY YEARS 1939 TO 1943 INCLUSIVE**

(1) Class	(2) Number of Losses N	(3) (4) Amount of Losses		(5) Average Primary Loss M <sub>p</sub> (3)÷(2)	(6) (7) (8) D-Ratios			(9) (10) (11) Credibilities			(12) Revised D-Ratio (6)x(9) +(7)x(10) +(8)x(11)
		Primary	Total		Indicated D <sub>i</sub> (3)÷(4)	Functional D <sub>f</sub> (Table III)	Under- lying D <sub>u</sub> *	Indicated Z <sub>i</sub> (2)	Functional Z <sub>f</sub> 1.0-(9)	Underlying Z <sub>u</sub> 47 (2)÷47	
2070	1,430	\$293,402	\$370,976	\$205	.79	.77	.73	.52	.45	.03	.78
2089	790	104,129	115,738	132	.90	.86	.87	.37	.57	.06	.89
2105	15	5,338	5,496	356	.97	.59	.83	.01	.23	.76	.78
2110	24	5,352	8,639	223	.62	.75	.74	.02	.32	.66	.74
2121	486	110,658	153,217	228	.72	.74	.78	.27	.64	.09	.74
2291	544	120,170	140,093	221	.86	.75	.72	.29	.63	.08	.78
2586	312	59,557	64,518	191	.92	.79	.83	.19	.68	.13	.82
2660	3,564	785,965	963,609	221	.82	.75	.79	.73	.26	.01	.80
2686	23	4,115	4,115	179	1.00	.80	.80	.02	.31	.67	.80
3515	476	116,801	150,388	245	.78	.72	.65	.26	.65	.09	.73
3516	15	3,352	3,353	223	1.00	.75	.75	.01	.23	.76	.75
3559	6	3,039	3,182	507	.96	.40	.79	-	.11	.89	.75
3632	4,751	1,204,871	1,544,496	254	.78	.71	.79	.78	.21	.01	.77
4362	10	4,781	8,589	478	.56	.44	.67	.01	.17	.82	.63
5348	54	15,707	32,689	291	.48	.67	.70	.04	.49	.47	.68
5403	1,225	361,153	573,703	295	.63	.66	.62	.48	.48	.04	.64
5551	445	117,864	189,887	265	.62	.70	.50	.25	.65	.10	.66
8018	1,303	285,081	372,186	219	.77	.75	.80	.49	.48	.03	.76
8044	458	98,789	170,080	216	.58	.76	.75	.25	.66	.09	.71
9052	1,376	302,279	434,364	220	.70	.75	.61	.51	.46	.03	.72
9079	4,062	738,709	904,509	182	.82	.80	.78	.75	.24	.01	.81
9170	35	12,039	22,956	344	.52	.60	.73	.03	.40	.57	.67

\*From Experience Rating Plan - D-Ratios effective December 31, 1945



TABLE II  
COMPARISON OF D-RATIOS FOR MASSACHUSETTS CLASSIFICATIONS

D<sub>u</sub> = Underlying D-Ratio from the Experience Rating Plan effective 12/31/45

D<sub>i</sub> = Indicated D-Ratio from Massachusetts experience for Policy Years 1939-1943 inclusive

D<sub>f</sub> = Functional D-Ratio corresponding to Average Primary Loss for Policy Years 1939-1943 inclusive

D<sub>r</sub> = Revised D-Ratio calculated as shown in Table I

Class	D <sub>u</sub>	D <sub>i</sub>	D <sub>f</sub>	D <sub>r</sub>	Class	D <sub>u</sub>	D <sub>i</sub>	D <sub>f</sub>	D <sub>r</sub>	Class	D <sub>u</sub>	D <sub>i</sub>	D <sub>f</sub>	D <sub>r</sub>
0006	.73	.67	.75	.72	2173	.78	1.00	.88	.78	2503	.77	.91	.67	.75
0042	.75	.88	.79	.79	2174	.90	.98	.84	.88	2531	.84	.96	.75	.81
0912	.65	.69	.69	.69	2177	.84	.94	.77	.82	2532	.81	.89	.73	.80
1748	.65	.68	.79	.75	2211	.61	.63	.71	.66	2554	.74	1.00	.80	.74
2001	.67	.77	.75	.74	2216	.61	.61	.70	.67	2537	.75	.99	.79	.77
2002	.81	.75	.67	.75	2220	.79	.79	.77	.78	2538	.81	.69	.77	.77
2003	.79	.76	.76	.76	2222	.79	.78	.78	.78	2560	.84	.83	.46	.82
2014	.79	.82	.73	.76	2260	.71	.70	.72	.71	2570	.75	.79	.77	.77
2016	.71	.97	.68	.71	2280	.90	1.00	.87	.90	2571	.78	.86	.73	.77
2021	.79	.75	.79	.78	2286	.72	.72	.75	.73	2575	.78	.60	.72	.75
2039	.87	.73	.73	.76	2289	.69	.74	.75	.74	2576	.74	.74	.69	.71
2041	.82	.78	.77	.78	2291	.72	.86	.75	.78	2578	.77	.95	.74	.77
2042	.81	.79	.65	.70	2300	.73	.74	.71	.72	258b	.72	.70	.76	.73
2045	.82	.39	.73	.78	2302	.83	.67	.75	.77	2586	.83	.82	.79	.82
2070	.73	.79	.77	.78	2303	.83	.81	.75	.77	2587	.72	.97	.80	.75
2081	.83	.67	.76	.78	2348	.72	.66	.74	.73	2600	.85	.97	.46	.84
2089	.87	.90	.86	.88	2351	.79	.85	.84	.82	2610	.77	1.00	.85	.78
2095	.79	.72	.77	.76	2352	.76	.69	.68	.70	2623	.72	.73	.75	.74
2101	.90	.72	.82	.82	2361	.78	.93	.80	.81	2640	.73	.93	.76	.75
2105	.83	.97	.99	.78	2362	.82	.81	.75	.77	2651	.75	.77	.73	.75
2110	.74	.62	.75	.74	2380	.74	.64	.79	.76	2654	.75	.61	.71	.73
2111	.81	.81	.80	.80	2384	.74	.91	.79	.75	2660	.79	.82	.75	.80
2112	.80	.82	.74	.77	2386	.85	1.00	.91	.85	2670	.79	1.00	.82	.79
2114	.84	1.00	.93	.85	2387	.74	.84	.80	.77	2681	.75	1.00	.86	.75
2121	.78	.72	.74	.74	2388	.73	1.00	.80	.78	2683	.82	.85	.82	.82
2131	.80	.95	.79	.80	2402	.81	.75	.74	.75	2686	.80	1.00	.80	.80
2143	.76	.52	.69	.73	2413	.82	.79	.74	.76	2688	.85	.85	.75	.78
2156	.80	.98	.77	.80	2416	.78	.81	.79	.79	2795	.83	.98	.75	.80
2157	.78	.78	.78	.78	2417	.80	.76	.74	.75	2812	.73	.71	.65	.68
2163	.78	.90	.77	.78	2501	.78	.82	.79	.81	3042	.81	.81	.71	.76

TABLE II (cont'd)

Class	D <sub>u</sub>	D <sub>i</sub>	D <sub>f</sub>	D <sub>r</sub>	Class	D <sub>u</sub>	D <sub>i</sub>	D <sub>f</sub>	D <sub>r</sub>	Class	D <sub>u</sub>	D <sub>i</sub>	D <sub>f</sub>	D <sub>r</sub>
3060	.85	.76	.55	.76	5146	.63	.96	.80	.70	7500	.72	.69	.68	.69
3066	.86	.79	.73	.76	5160	.64	.56	.63	.63	7502	.68	1.00	.89	.68
4076	.81	.75	.71	.73	5183	.72	.72	.72	.72	7539	.56	.53	.63	.59
3152	.79	.77	.70	.73	5184	.72	.80	.67	.70	7570	.69	1.00	.81	.69
3188	.84	.58	.73	.77	5188	.68	.60	.59	.64	7600	.56	1.00	.89	.60
3200	.84	.84	.71	.76	5190	.57	.55	.65	.62	7609	.57	.96	.56	.57
3315	.77	.78	.73	.74	5200	.82	.67	.72	.75	8006	.97	.80	.76	.78
3316	.77	.68	.69	.72	5203	.60	.62	.69	.63	8007	.76	.69	.81	.79
3400	.73	.77	.69	.72	5213	.62	.69	.62	.65	8017	.80	.79	.76	.78
3507	.80	.73	.77	.78	5215	.62	.55	.66	.63	8018	.80	.77	.75	.76
3515	.65	.78	.72	.73	5348	.70	.48	.67	.68	8032	.78	.78	.76	.77
3516	.76	1.00	.75	.75	5403	.62	.63	.66	.64	8044	.75	.58	.76	.71
3527	.80	.71	.73	.75	5437	.63	.62	.67	.66	8049	.80	.93	.82	.81
3548	.79	.96	.73	.77	5443	.69	.88	.77	.71	8090	.80	.99	.75	.79
3558	.85	.80	.60	.67	5461	.63	.50	.56	.56	8103	.77	.83	.73	.75
3559	.79	.96	.40	.75	5462	.65	.73	.71	.69	8105	.75	.73	.75	.75
3561	.74	.96	.65	.73	5480	.69	.66	.67	.67	8264	.84	.75	.80	.80
3574	.84	.95	.69	.78	5490	.53	.62	.66	.64	8285	.83	1.00	.70	.82
3612	.78	.77	.72	.74	5491	.53	1.00	.85	.54	8295	.77	.87	.76	.77
3629	.84	.78	.71	.77	5538	.62	.72	.71	.70	8731	.71	1.00	.42	.70
3632	.79	.78	.71	.77	5551	.50	.62	.70	.66	8745	.84	.97	.76	.80
3634	.71	.75	.70	.72	5645	.63	.61	.69	.65	8833	.75	.63	.71	.70
3635	.90	.89	.67	.74	5651	.63	.78	.71	.70	9015	.71	.64	.70	.67
8639	.76	.75	.70	.72	6204	.69	.69	.69	.69	9052	.61	.70	.75	.72
3724	.65	.63	.65	.65	6504	.84	.78	.73	.76	9053	.84	.64	.68	.82
3726	.71	.68	.58	.68	6824	.69	.81	.67	.70	9060	.83	.89	.78	.80
3905	.78	1.00	.76	.78	6872	.61	.65	.67	.65	9061	.85	.79	.77	.79
4000	.64	.61	.65	.64	7201	.71	1.00	.77	.73	9063	.79	.76	.75	.76
4273	.86	.98	.80	.83	7205	.68	.83	.75	.71	9079	.78	.82	.80	.81
4279	.69	.67	.74	.71	7207	.73	.97	.81	.75	9090	.75	.73	.84	.81
4562	.67	.56	.44	.63	7219	.74	.73	.75	.74	9170	.73	.52	.60	.67
4501	.84	.69	.54	.82	7309	.68	.71	.76	.74	9800	.63	.66	.56	.59
5000	.62	.76	.63	.62	7380	.71	.67	.75	.71					
5022	.62	.57	.65	.62	7382	.69	.66	.73	.71					
5059	.48	.65	.57	.50	7392	.79	.78	.77	.78					

APPENDIX A  
FUNCTIONAL D-RATIO

For each classification there exists an expected or true value of the ratio of primary losses to total losses which we shall indicate by the script  $\mathcal{D}$ . From classification experience, there will be available an "indicated" ratio of primary losses to total losses which we shall designate as  $D$ . In addition to the indicated  $D$ -ratios there are available what we shall call functional  $D$ -ratios which are the estimates of  $\mathcal{D}$  made from observed value of other statistics such as:

$D_1$	determined from	$\frac{1}{M_p}$	where $M_p$ is the average amount of primary loss per loss.
$D_2$	"	"	$R$ which is the ratio of the number of losses which involve an excess loss to the total number of losses.
$D_3$	"	"	$\frac{R}{M_p}$ which is the reciprocal of the average amount of primary loss per loss which involves an excess loss.
$D_4$	"	"	$M_e$ which is the average amount of excess loss per loss which involves an excess loss.
$D_5$	"	"	$M'_e$ which is the average amount of excess loss per loss.
$D_6$	"	"	$M_e/M_p =$ the ratio of $M_e$ to $M_p$ .

We need to determine whether any of these functional  $D$ -Ratios are more efficient estimates of the true  $\mathcal{D}$  than is the indicated  $D$ , and if so, which one is the most efficient.

In order to obtain results which could be directly assimilated without undue use of mathematical formulae, it seemed best to make an empirical test. This consisted of preparing 1,000 punch cards each representing a single loss such that the 1,000 losses have a distribution by size of loss approximately the same as that for all losses in Massachusetts in 1940-41. Random numbers were assigned to the 1,000 punch cards and 100 random samples of 50 losses each were thus obtained. The indicated values of each of the statistics mentioned above were calculated for each of the 100 observations and the squares of the coefficients of variation of these 100 observations were calculated for each statistic.

It will be realized that in this way we have made 100 empirical observations of experience for a single classification for which the true values are known and are thus in a position to establish which of the statistics are

stable and which are subject to wide chance variation. The squares of the coefficient of variation were as follows:

<u>Statistic</u>	<u>Square of Coefficient of Variation</u>
$\frac{1}{D} - 1$	.6793
$\frac{1}{M_p}$	.0466
R	.1443
$\frac{R}{M_p}$	.0681
$M_e$	1.1021
$M'_e$	.8234
$\frac{M_e}{M_p}$	1.3927

The statistics were handled in the above forms in order that they might be on as nearly a uniform basis as possible. The following functional relationships between these statistics will indicate why the above forms were chosen:

$$\left(\frac{1}{D} - 1\right) = \left(\frac{1}{M_p}\right) (M'_e) = (R) \left(\frac{M_e}{M_p}\right) = \left(\frac{R}{M_p}\right) (M_e)$$

The comparatively small sampling variation in  $\frac{1}{M_p}$ , R and  $\frac{R}{M_p}$  would indicate the possibility that these statistics might produce more efficient estimates of  $\mathcal{D}$  than the indicated values of D.

The experience for all of the Massachusetts classifications were cut on punch cards together with the values of these three statistics calculated from the classification experience. These classification cards were then sorted successively by each of these statistics and tabulated to obtain ap-

proximately the relationships between  $\left(\frac{1}{D} - 1\right)$  and  $\frac{1}{M_p}$ ,  $\mathcal{R}$  and  $\frac{\mathcal{R}}{M_p}$  (where

the script letters indicate the true values as contrasted to sample values). Charts were then drawn for each of the three statistics similar to that

shown in Figure A for  $\left(\frac{1}{D} - 1\right)$  and  $\frac{1}{M_p}$ .

By entering these charts with the observed values of  $\frac{1}{M_p}$ , R and  $\frac{R}{M_p}$  obtained

from the 100 random samples, the functional estimates of  $(\frac{1}{D} - 1)$  were

obtained for comparison as to efficiency with the observed values of  $(\frac{1}{D} - 1)$ .

The following squares of coefficients of variation were obtained:

<u>Statistic</u>	<u>Squares of Coefficients of Variation</u>
$(\frac{1}{D} - 1)$ estimated from $(\frac{1}{D} - 1)$	.6793
$(\frac{1}{D} - 1)$ estimated from $\frac{1}{M_p}$	.1007
$(\frac{1}{D} - 1)$ estimated from R	.1443
$(\frac{1}{D} - 1)$ estimated from $\frac{R}{M_p}$	.1824

Thus we find that each of these three statistics is more efficient than

$(\frac{1}{D} - 1)$  itself and that  $\frac{1}{M_p}$  appears to be the most efficient. It seemed worth

while, however, to substantiate this with samples from distributions of losses having rather different values of  $D$ . To do this the losses on the 1,000 punch cards representing the average Massachusetts distribution of losses were first reduced 50% and then increased 50% and the new values of primary and excess losses determined. Twenty samples of 50 losses each were then taken from each of these new empirical classifications and the

estimated values of  $(\frac{1}{D} - 1)$  determined from the charts as before. The

squares of the coefficient of variation were as follows:

$\frac{1}{\mathcal{D}}$ ( $\frac{1}{\mathcal{D}} - 1$ ) Estimated From	Squares of Coefficient of Variation			
	Losses Increased 50% (1)	Average Loss Distribution (2)	Losses Reduced 50% (3)	Weighted Averaged of (1), (2) and (3)
$\frac{1}{\mathcal{D}}$ ( $\frac{1}{\mathcal{D}} - 1$ )	.4431	.6793	1.2800	.7314
$\frac{1}{M_p}$	.0738	.1007	.1004	.0968
R	.1434	.1443	.1880	.1504
$\frac{R}{M_p}$	.1169	.1824	.2091	.1769

It is seen that the estimates made on the basis of the value of  $M_p$  are the most efficient in each case.

Figure B and Table III, expressing  $\mathcal{D}$  in terms of  $M_p$ , were obtained from Figure A and provide direct means for estimating  $\mathcal{D}$  from  $M_p$ . Figure C shows a comparison of the true  $\mathcal{D}$ -Ratios with the indicated values of  $\mathcal{D}$  for each of the three empirical classifications and Figure D shows the same comparison of the true  $\mathcal{D}$ -Ratios with the functional  $\mathcal{D}$ -Ratios estimated from the values of  $M_p$ .

FIGURE A

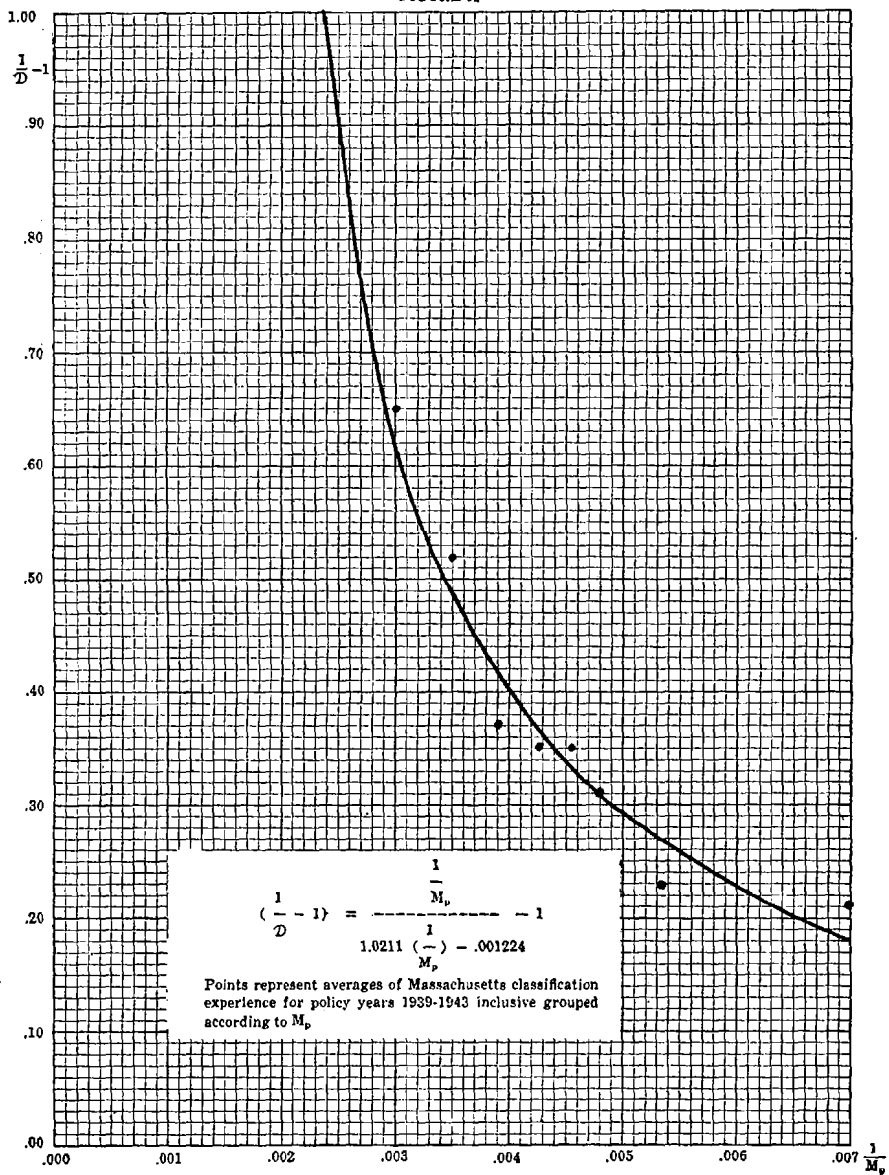


FIGURE B

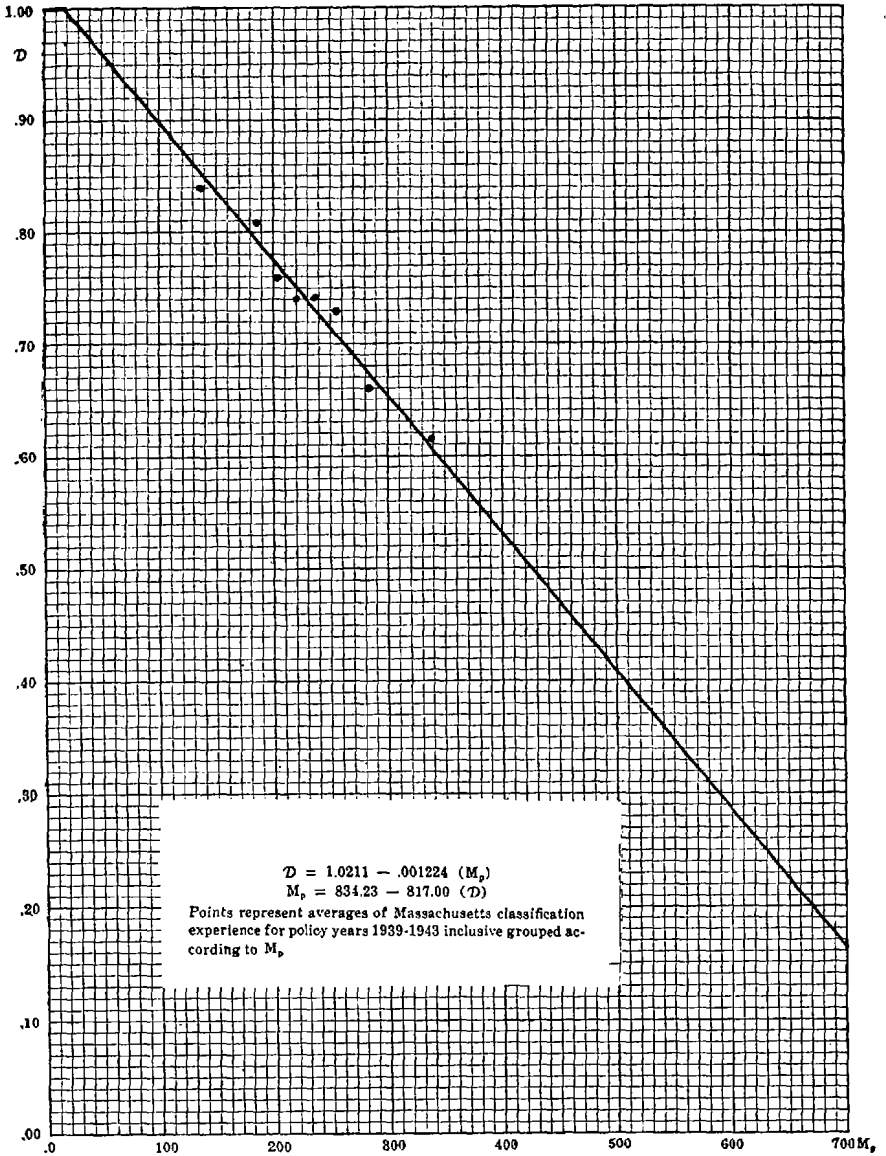




TABLE III

FUNCTIONAL D-RATIOS,  $D_f$ , FOR VARIOUS AVERAGE PRIMARY LOSSES

$M_p$	$D_f$	$M_p$	$D_f$
0 - 21	1.00	341 - 348	.60
22 - 29	.99	349 - 356	.59
30 - 38	.98	357 - 364	.58
39 - 46	.97	365 - 373	.57
47 - 54	.96	374 - 381	.56
55 - 62	.95	382 - 389	.55
63 - 70	.94	390 - 397	.54
71 - 79	.93	398 - 405	.53
80 - 87	.92	406 - 413	.52
88 - 95	.91	414 - 422	.51
96 - 103	.90	423 - 430	.50
104 - 111	.89	431 - 438	.49
112 - 119	.88	439 - 446	.48
120 - 128	.87	447 - 454	.47
129 - 136	.86	455 - 462	.46
137 - 144	.85	463 - 471	.45
145 - 152	.84	472 - 479	.44
153 - 160	.83	480 - 487	.43
161 - 168	.82	488 - 495	.42
169 - 177	.81	496 - 503	.41
178 - 185	.80	504 - 512	.40
186 - 193	.79	513 - 520	.39
194 - 201	.78	521 - 528	.38
202 - 209	.77	529 - 536	.37
210 - 217	.76	537 - 544	.36
218 - 226	.75	545 - 552	.35
227 - 234	.74	553 - 561	.34
235 - 242	.73	562 - 569	.33
243 - 250	.72	570 - 577	.32
251 - 258	.71	578 - 585	.31
259 - 266	.70	586 - 593	.30
267 - 275	.69	594 - 601	.29
276 - 283	.68	602 - 610	.28
284 - 291	.67	611 - 618	.27
292 - 299	.66	619 - 626	.26
300 - 307	.65	627 - 634	.25
308 - 315	.64	635 - 642	.24
316 - 324	.63	643 - 650	.23
325 - 332	.62	651 - 659	.22
333 - 340	.61	660 - 667	.21

FIGURE D

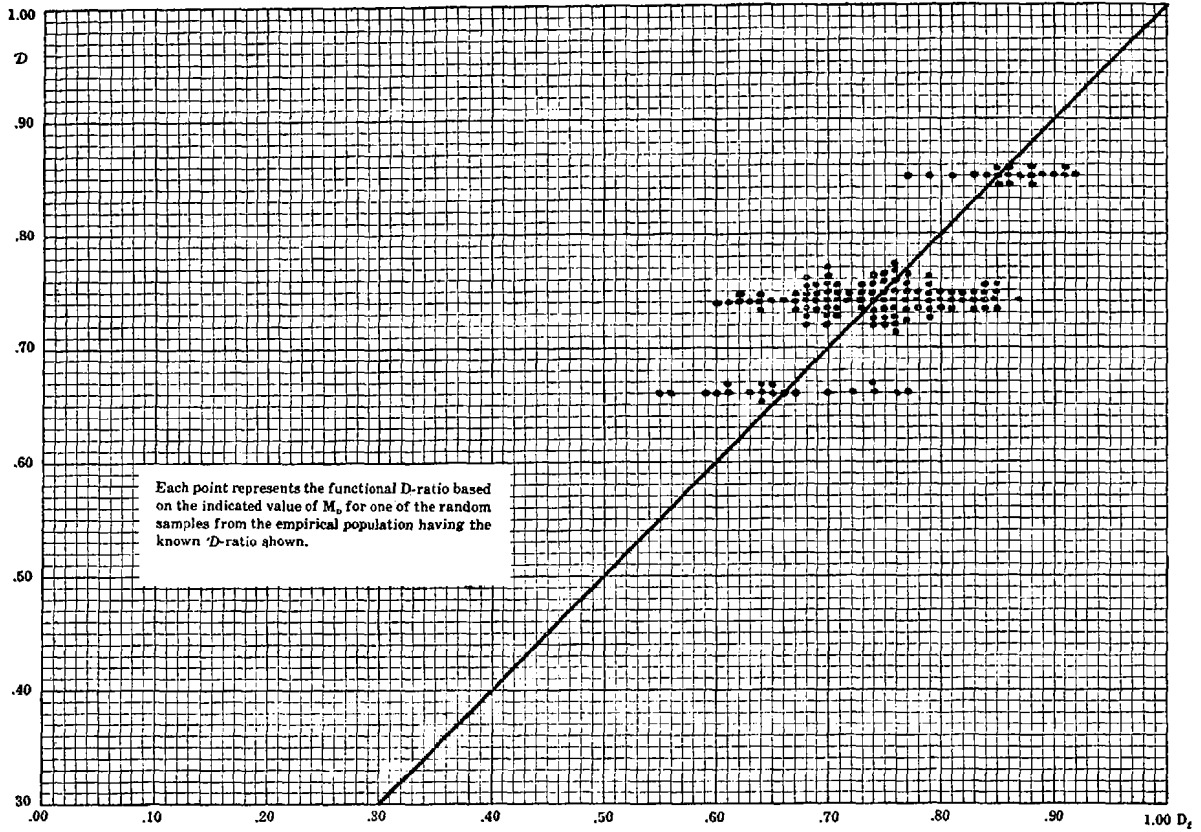
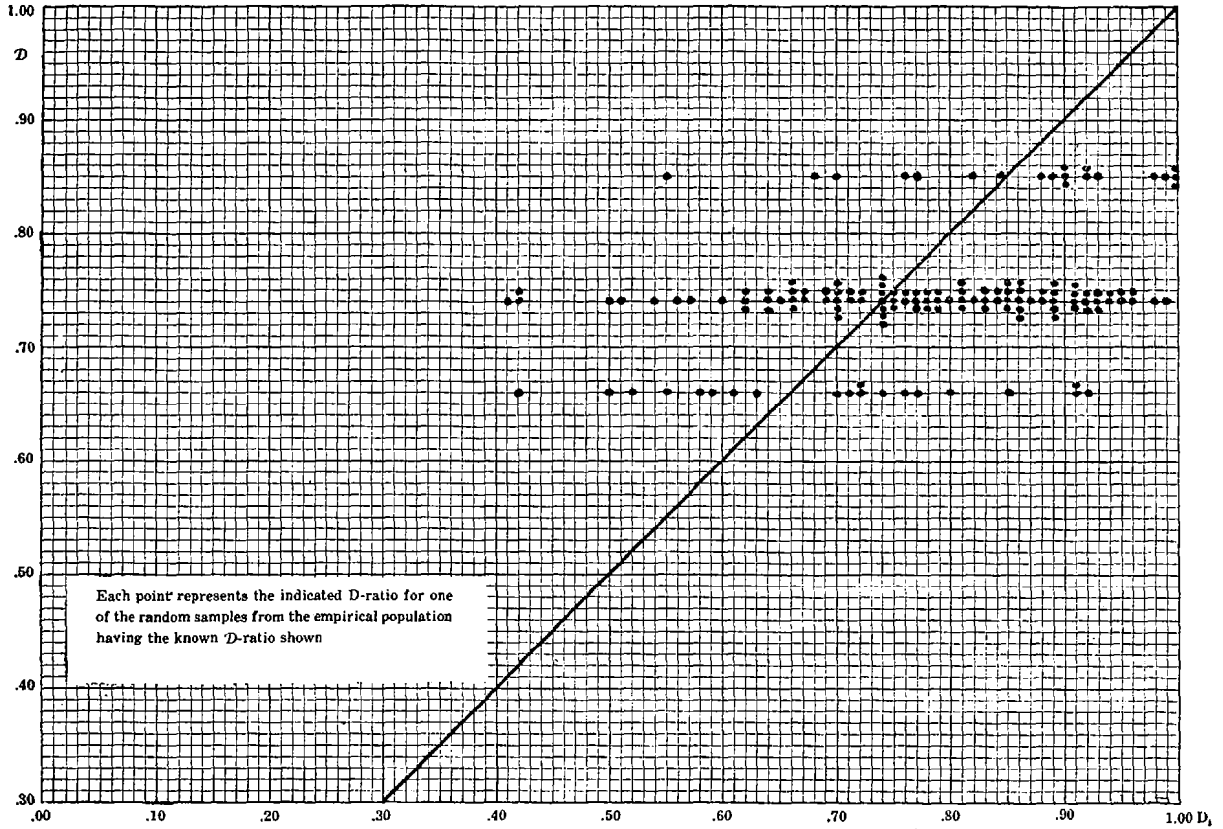


FIGURE C



VALUATION OF THE DEATH BENEFITS PROVIDED BY  
THE WORKMEN'S COMPENSATION LAW OF N. Y.

by

HAROLD W. SCHLOSS

The problems raised by the subject of this paper are those which are of longstanding interest to the profession and go back to the very infancy of this society. In fact this paper is the latest of a series of the same title, the first, by Mr. W. W. Greene having appeared in Volume I of the Proceedings thirty-four years ago. In order to simplify the task so that non-technical people could value cases as well as to insure uniformity the Workmen's Compensation Board has had prepared tables to value certain benefits under the N. Y. Workmen's Compensation Law. These tables have been as follows:

	<i>Bulletin No.</i>	<i>Date of Death</i>
N. Y. Dept. of Labor Bulletin	222	July 1, 1948
	207	July 1, 1939 to July 1, 1948
	190	July 1, 1937 to July 1, 1939
	120	July 1, 1922 to July 1, 1937
State Industrial Commission Bulletin June	1917	
Officers' Tables	1915	

Several members of the Society have participated, chiefly in an advisory capacity, in the preparation of the present bulletin. These have been Miss Davis and Messrs. Carleton, Dorweiler, Graham, Johnson and Perryman.

The syllabus for the examination on Life Contingencies contains no references to the Proceedings later than Volume II and although the theory has not changed it is felt that our literature should be brought up to date at this opportune time because of current interest in the topic.

Chapter 232, Laws of 1948, effective July 1, 1948 amended the Workmen's Compensation Law of New York and made necessary the preparation of new tables for the valuation of death benefits. The purpose of this paper is to make available to the actuarial profession the formulae underlying these tables and to demonstrate to students a method of deriving these formulae.

The pertinent sections of the amendment are as follows:

16. 1-b. If there be a surviving wife (or dependent husband) and no child of the deceased under the age of eighteen years and no child of any age dependent blind or crippled, and the death occurs on or after July first, nineteen hundred forty-eight, to such wife (or dependent husband) forty per centum of the average wages of the deceased during widowhood (or dependent widowerhood) with two years' compensation in one sum, upon re-marriage; and where the death occurred prior to July first,

*nineteen hundred forty-eight, to such wife (or dependent husband) thirty per centum of such wages during widowhood (or dependent widowerhood) with two years' compensation in one sum, upon remarriage.*

Subdivision two of section sixteen of the Workmen's Compensation Law is hereby amended to read as follows:

16. 2. If there be a surviving wife (or dependent husband) and a surviving child or children of the deceased under the age of eighteen years or a surviving child or children of any age dependent blind or crippled, and the death occurs on or after July first, nineteen hundred forty-eight, to such wife (or dependent husband) thirty per centum of the average wages of the deceased during widowhood (or dependent widowerhood) with two years' compensation in one sum, upon remarriage; and the additional amount of twenty per centum of such wages for each such child until the age of eighteen years or until the removal of the dependency of the blind or crippled child or children; in case of the subsequent death or remarriage of such surviving wife (or dependent husband) any surviving child of the deceased employee, at the time under eighteen years of age or dependent through mental or physical infirmity, shall have his compensation increased to thirty per centum of such wages, and the same shall be payable until he shall reach the age of 18 years or until such dependent blind or crippled condition shall have been removed; provided that the total amount payable shall in no case exceed sixty-six and two-thirds per centum of such wages. Upon statutory termination of compensation payments to all such children, the compensation of the surviving wife (or dependent husband) shall be increased to forty per centum of such wages with two years' compensation, at such rate, in one sum, upon remarriage.

*If there be a surviving wife (or dependent husband) and any of the aforementioned surviving children, and the death occurred prior to July first, nineteen hundred forty-eight, to such wife (or dependent husband) thirty per centum of the average wages of the deceased during widowhood (or dependent widowerhood) with two years' compensation in one sum, upon remarriage; and the additional amount of ten per centum of such wages for each such child until eighteen years of age or until the removal of the dependency of the blind or crippled child or children; in case of the subsequent death or remarriage of such surviving wife (or dependent husband) any surviving child of the deceased shall have his compensation increased to fifteen per centum of such wages until he shall reach the age of eighteen years or until such dependent blind or crippled condition shall have been removed; provided that the total amount payable shall in no case exceed sixty-six and two-thirds per centum of such wages."*

In valuing death benefits prior to this amendment one assumption made was that  $p_{y_1} = p_{y_2} = \dots = S = .99479364$ , where  $p_{y_1}$  was the probability that the  $i_{th}$  youngest child would survive one year to age  $y_1 + 1$ . By this device it was possible to calculate annuity values knowing only the number of children involved and the age of the oldest of these. Otherwise it would have been necessary to calculate annuities for each combination of ages. This assumption is still made.

In addition it has been necessary to make one other assumption. Prior to the amendment the benefit of the child depended on the status of the widow (whether she was alive and not remarried, or remarried, or deceased) but the widows benefit did not depend on the the status of the child. Now it does, for the widow receives 40% of the deceased's wages if she has no dependent children under eighteen and 30% otherwise. At the time of remarriage the widow receives a dowry of two years payments. This is interpreted to be two years of actual payments and not two years of payments being received at time of remarriage. For example, if a widow remarried and had a child or children, the youngest of whom, was  $16\frac{1}{2}$  she would (except for the remarriage) receive benefits at the rate of 30% for a year and a half, and at the rate of 40% thereafter. The remarriage benefit is then the present value of payments at the rate of 30% for the first year and a half and at the rate of 40% for the last half year. One proposed solution to the problem of how to value this remarriage endowment is to run the term of the endowment until the youngest child reaches age seventeen. This means that for valuation purposes we would pay the widow her dowry at a 30% rate if the youngest child was less than seventeen and at a 40% rate dowry if he was seventeen or greater. We have made the tacit assumption that the average age is seventeen of the youngest child of these widows who remarry with youngest child between sixteen and eighteen. The resulting inaccuracy is very small as may be seen by comparing it with the true expression.

The true value of the increasing 10% is

$$\frac{1}{2} \int_{16-y}^{18-y} \frac{20}{l_x} (t - 16 + y) s^t v^t \frac{m_{x+t}}{1 - \frac{1}{2} q_{x+t}} dt$$

If the youngest child is 16 at time of remarriage the widow gets none of the extra 10% and if the youngest child is 18 at time of remarriage the widow gets the extra 10% for 2 years. This expression

$$= \frac{1}{2} \int_{16-y}^{17-y} f(t) dt + \frac{1}{2} \int_{17-y}^{18-y} f(t) dt \quad \text{If we replace}$$

$$\frac{1}{2} \int_{17-y}^{18-y} f(t) dt \text{ by } \frac{1}{2} \int_{17-y}^{17-y} f(t) dt \quad \text{we have}$$

$$\int_{16-y}^{17-y} f(t) dt \text{ as the expression to then be approximated. We have also}$$

neglected the small values for those cases where the remarriage takes place with youngest child  $\leq 16$  and this child dies before reaching age 18.

The tables affected by the amendment are as follows:

**I Widow or Widower—Present Value of Compensation per \$100 Annual Wages Payable Until Death or Remarriage.**

$$40 \bar{a}_{x'} + 80 \bar{E}_{x'}$$

**I-A Reduction on account of Youngest Child in Present Value of Widow's or Widower's Portion of Compensation per \$100 of Annual Wages Payable (per Table I) Until Death or Remarriage.**

$$10 \bar{1}\bar{a}_{x'y_1 : \overline{18-y_1}|} + 20 \bar{1}\bar{E}_{x'y_1 : \overline{17-y_1}|}$$

**I-B Reduction on account of Second Youngest Child . . .**

$$10 (\bar{1}\bar{a}_{x'y_2 : \overline{18-y_2}|} - 2\bar{a}_{x'y_2 : \overline{18-y_2}|}) + 20 (\bar{1}\bar{E}_{x'y_2 : \overline{17-y_2}|} - 2\bar{E}_{x'y_2 : \overline{17-y_2}|})$$

**I-C Reduction on account of Third Youngest Child . . .**

$$10 (\bar{1}\bar{a}_{x'y_3 : \overline{18-y_3}|} - 2\bar{2}\bar{a}_{x'y_3 : \overline{18-y_3}|} + \bar{3}\bar{a}_{x'y_3 : \overline{18-y_3}|}) + 20 (\bar{1}\bar{E}_{x'y_3 : \overline{18-y_3}|} - 2\bar{2}\bar{E}_{x'y_3 : \overline{18-y_3}|} + \bar{3}\bar{E}_{x'y_3 : \overline{18-y_3}|})$$

**I-D Reduction on account of Fourth Youngest Child . . .**

$$10 (\bar{1}\bar{a}_{x'y_4 : \overline{18-y_4}|} - 3\bar{2}\bar{a}_{x'y_4 : \overline{18-y_4}|} + 3\bar{3}\bar{a}_{x'y_4 : \overline{18-y_4}|} - \bar{4}\bar{a}_{x'y_4 : \overline{18-y_4}|}) + 20 (\bar{1}\bar{E}_{x'y_4 : \overline{17-y_4}|} - 3\bar{2}\bar{E}_{x'y_4 : \overline{17-y_4}|} + 3\bar{3}\bar{E}_{x'y_4 : \overline{17-y_4}|} - \bar{4}\bar{E}_{x'y_4 : \overline{17-y_4}|})$$

**I-E Reduction on account of Fifth Youngest Child . . .**

$$10 (\bar{1}\bar{a}_{x'y_5 : \overline{18-y_5}|} - 4\bar{2}\bar{a}_{x'y_5 : \overline{18-y_5}|} + 6\bar{3}\bar{a}_{x'y_5 : \overline{18-y_5}|} - 4\bar{4}\bar{a}_{x'y_5 : \overline{18-y_5}|} + \bar{5}\bar{a}_{x'y_5 : \overline{18-y_5}|}) + 20 (\bar{1}\bar{E}_{x'y_5 : \overline{17-y_5}|} - 4\bar{2}\bar{E}_{x'y_5 : \overline{17-y_5}|} + 6\bar{3}\bar{E}_{x'y_5 : \overline{17-y_5}|} - 4\bar{4}\bar{E}_{x'y_5 : \overline{17-y_5}|} + \bar{5}\bar{E}_{x'y_5 : \overline{17-y_5}|})$$

**IV Youngest Child—Present Value Per \$100 Annual Wages Payable Until Age 18**

$$30 \bar{1}\bar{a}_{y_1 : \overline{18-y_1}|} - 10 \bar{1}\bar{a}_{x'y_1 : \overline{18-y_1}|}$$

**V Second Youngest Child**

$$30 \bar{1}\bar{a}_{y_2 : \overline{18-y_2}|} - 10 \bar{1}\bar{a}_{x'y_2 : \overline{18-y_2}|} - 3\frac{1}{2} \bar{2}\bar{a}_{x'y_2 : \overline{18-y_2}|}$$

**VI Third Youngest Child**

$$30 \bar{1}\bar{a}_{y_3 : \overline{18-y_3}|} - 23\frac{1}{2} \bar{2}\bar{a}_{y_3 : \overline{18-y_3}|} - 10 \bar{1}\bar{a}_{x'y_3 : \overline{18-y_3}|} - 6\frac{1}{2} \bar{2}\bar{a}_{x'y_3 : \overline{18-y_3}|} + 10 \bar{3}\bar{a}_{x'y_3 : \overline{18-y_3}|}$$

**VII 4th Youngest Child—Present Value Per \$100 Annual Wages Payable Until Age 18**

$$30 \bar{1}\bar{a}_{y_4 : \overline{18-y_4}|} - 70 \bar{3}\bar{a}_{y_4 : \overline{18-y_4}|} + 40 \bar{4}\bar{a}_{y_4 : \overline{18-y_4}|} - 10 \bar{1}\bar{a}_{x'y_4 : \overline{18-y_4}|} - 10 \bar{2}\bar{a}_{y_4 : \overline{18-y_4}|} + 30 \bar{3}\bar{a}_{x'y_4 : \overline{18-y_4}|} - 10 \bar{4}\bar{a}_{x'y_4 : \overline{18-y_4}|}$$

VIII 5th Youngest Child—Present Value Per \$100 Annual Wages Payable Until Age 18

$$30 \, {}_1\bar{a}_{y:\overline{18-y}|} - 140 \, {}_2\bar{a}_{y:\overline{18-y}|} + 160 \, {}_3\bar{a}_{y:\overline{18-y}|} - 50 \, {}_4\bar{a}_{y:\overline{18-y}|} - 10 \, {}_5\bar{a}_{y:\overline{18-y}|} \\ - 13\frac{1}{2} \, {}_2\bar{a}_{x'y:\overline{18-y}|} + 60 \, {}_3\bar{a}_{x'y:\overline{18-y}|} - 40 \, {}_4\bar{a}_{x'y:\overline{18-y}|} + 3\frac{1}{2} \, {}_5\bar{a}_{x'y:\overline{18-y}|}$$

IX Children at 30%—Present Value Per \$100 Annual Wages Payable Until Age 18

1st & 2nd Child  $30 \, {}_1\bar{a}_{y:\overline{18-y}|}$

3rd Child  $30 \, {}_1\bar{a}_{y:\overline{18-y}|} - 23\frac{1}{2} \, {}_2\bar{a}_{y:\overline{18-y}|}$

4th Child  $30 \, {}_1\bar{a}_{y:\overline{18-y}|} - 70 \, {}_2\bar{a}_{y:\overline{18-y}|} + 40 \, {}_3\bar{a}_{y:\overline{18-y}|}$

5th Child  $30 \, {}_1\bar{a}_{y:\overline{18-y}|} - 140 \, {}_2\bar{a}_{y:\overline{18-y}|} + 160 \, {}_3\bar{a}_{y:\overline{18-y}|} - 50 \, {}_4\bar{a}_{y:\overline{18-y}|}$

6th Child  $30 \, {}_1\bar{a}_{y:\overline{18-y}|} - 233\frac{1}{2} \, {}_2\bar{a}_{y:\overline{18-y}|} + 400 \, {}_3\bar{a}_{y:\overline{18-y}|} - 250 \, {}_4\bar{a}_{y:\overline{18-y}|} \\ + 53\frac{1}{2} \, {}_5\bar{a}_{y:\overline{18-y}|}$

7th Child  $30 \, {}_1\bar{a}_{y:\overline{18-y}|} - 350 \, {}_2\bar{a}_{y:\overline{18-y}|} + 800 \, {}_3\bar{a}_{y:\overline{18-y}|} - 750 \, {}_4\bar{a}_{y:\overline{18-y}|} \\ + 320 \, {}_5\bar{a}_{y:\overline{18-y}|} - 50 \, {}_7\bar{a}_{y:\overline{18-y}|}$

IX-A Brothers, Sisters and Grandchildren at 25%—Present Value per \$100 Annual Wages Payable Until Age 18

1st & 2nd Child  $25 \, {}_1\bar{a}_{y:\overline{18-y}|}$

3rd Child  $25 \, {}_1\bar{a}_{y:\overline{18-y}|} - 8\frac{1}{2} \, {}_2\bar{a}_{y:\overline{18-y}|}$

4th Child  $25 \, {}_1\bar{a}_{y:\overline{18-y}|} - 25 \, {}_2\bar{a}_{y:\overline{18-y}|}$

5th Child  $25 \, {}_1\bar{a}_{y:\overline{18-y}|} - 50 \, {}_2\bar{a}_{y:\overline{18-y}|} + 25 \, {}_3\bar{a}_{y:\overline{18-y}|}$

6th Child  $25 \, {}_1\bar{a}_{y:\overline{18-y}|} - 83\frac{1}{2} \, {}_2\bar{a}_{y:\overline{18-y}|} + 125 \, {}_3\bar{a}_{y:\overline{18-y}|} - 66\frac{1}{2} \, {}_4\bar{a}_{y:\overline{18-y}|}$

7th Child  $25 \, {}_1\bar{a}_{y:\overline{18-y}|} - 125 \, {}_2\bar{a}_{y:\overline{18-y}|} + 375 \, {}_3\bar{a}_{y:\overline{18-y}|} - 400 \, {}_4\bar{a}_{y:\overline{18-y}|} \\ + 125 \, {}_7\bar{a}_{y:\overline{18-y}|}$

X Parent or Grandparent—Present Value Per \$100 Annual Wages Payable Until Age 18

$40 \, \bar{a}_w$



## XV Suspension of Payments to Widow (X) and no Children

$$40 \bar{a}_{x':\bar{t}} + 80 \bar{E}_{x':\bar{t}}$$

## XVI Suspension of Widow's Portion of Payments to Widow (X) with One Child

$$40 \bar{a}_{x':\bar{t}} + 80 \bar{E}_{x':\bar{t}} - 10 \bar{a}_{x'y_1:\bar{t}} - 20 \bar{E}_{x'y_1:\bar{t}}$$

## XVII Suspension of Widow's Portion of Payments to Widow (X) with Two Children

$$40 \bar{a}_{x':\bar{t}} + 80 \bar{E}_{x':\bar{t}} - 10 (2 \bar{a}_{x':\bar{t}} - 2 \bar{a}_{x'y_1:\bar{t}}) - 20 (2 \bar{E}_{x':\bar{t}} - 2 \bar{E}_{x'y_1:\bar{t}})$$

## XVIII Suspension of Widow's Portion of Payments to Widow (X) with Three Children

$$40 \bar{a}_{x':\bar{t}} + 80 \bar{E}_{x':\bar{t}} - 10 (3 \bar{a}_{x':\bar{t}} - 3 \bar{a}_{x'y_1:\bar{t}} + 3 \bar{a}_{x'y_2:\bar{t}}) \\ - 20 (3 \bar{E}_{x':\bar{t}} - 3 \bar{E}_{x'y_1:\bar{t}} + 3 \bar{E}_{x'y_2:\bar{t}})$$

## XIX Suspension of Widow's Portion of Payments to Widow (X) with Four Children

$$40 \bar{a}_{x':\bar{t}} + 80 \bar{E}_{x':\bar{t}} - 10 (4 \bar{a}_{x':\bar{t}} - 6 \bar{a}_{x'y_1:\bar{t}} + 4 \bar{a}_{x'y_2:\bar{t}} - 4 \bar{a}_{x'y_3:\bar{t}}) \\ - 20 (4 \bar{E}_{x':\bar{t}} - 6 \bar{E}_{x'y_1:\bar{t}} + 4 \bar{E}_{x'y_2:\bar{t}} - 4 \bar{E}_{x'y_3:\bar{t}})$$

## XX Suspension of Widow's Portion of Payments to Widow (X) with Five Children

$$40 \bar{a}_{x':\bar{t}} + 80 \bar{E}_{x':\bar{t}} \\ - 10 (5 \bar{a}_{x':\bar{t}} - 10 \bar{a}_{x'y_1:\bar{t}} + 10 \bar{a}_{x'y_2:\bar{t}} - 5 \bar{a}_{x'y_3:\bar{t}} + 5 \bar{a}_{x'y_4:\bar{t}}) \\ - 20 (5 \bar{E}_{x':\bar{t}} - 10 \bar{E}_{x'y_1:\bar{t}} + 10 \bar{E}_{x'y_2:\bar{t}} - 5 \bar{E}_{x'y_3:\bar{t}} + 5 \bar{E}_{x'y_4:\bar{t}})$$

In deriving these formulae, the chief difficulty lies in valuing the limitation due to the maximum benefit which is  $66\frac{2}{3}\%$  of the deceased's wages. A rather neat expression can be developed for this.

Let  $\phi$  be the reduction from the value of the benefit on account of the maximum limitation.

${}_w\phi(y)$  = reduction for  $w$  children considering the mortality of the children  $y$

${}_w\phi(x'y)$  = reduction for  $w$  children considering the mortality of the widow  $x'$  and the children  $y$

$\phi_w(y)$  = reduction for the  $w^{\text{th}}$  youngest child

$\phi_w(x'y)$  = reduction for the  $w^{\text{th}}$  youngest child

$p_y$  = probability that a child aged  $y$  will survive  $t$  years to age  $y + t$

For purposes of these tables  ${}_t p_y$  is a constant for  $y < 18$

$${}^m C_r = \frac{m!}{r! (m - r)!} = \text{number of combination of } m \text{ things taken } r \text{ at a time.}$$

The probability that exactly  $r$  children survive out of  $m$  is then

$$\begin{aligned} P &= {}^m C_r p^r (1 - p)^{m-r} \\ &= {}^m C_r p^r (1 - {}^{m-r} C_1 p + {}^{m-r} C_2 p^2 - {}^{m-r} C_3 p^3 \dots \dots (-1)^{m-r} p^{m-r}) \\ &= {}^m C_r \{ p^r - {}^{m-r} C_1 p^{r+1} + {}^{m-r} C_2 p^{r+2} \dots \dots (-1)^{m-r} p^m \} \end{aligned}$$

For a group of  $r$  children surviving the probability is  $p^r$  and the  $r$  survivors may be selected in  ${}^m C_r$  ways from the group of  $m$  children. All of the remaining  $m-r$  children fail to survive.

Since  ${}^m C_r {}^{m-r} C_t = {}^m C_{r+t} {}^{r+t} C_t$

$$\begin{aligned} P &= {}^m C_r p^r - {}^m C_r {}^{m-r} C_1 p^{r+1} + {}^m C_r {}^{m-r} C_2 p^{r+2} + \dots \dots (-1)^{m-r} {}^m C_r p^m \\ &= {}^m C_r p^r - {}^m C_{r+1} {}^{r+1} C_1 p^{r+1} + {}^m C_{r+2} {}^{r+2} C_2 p^{r+2} + \dots \dots (-1)^{m-r} {}^m C_r p^m \end{aligned}$$

Let  ${}^m C_{r+t} p^{r+t} = Z^{r+t}$

and  $m \rightarrow \infty$

$$\begin{aligned} P &= Z^r - {}^{r+1} C_1 Z^{r+1} + {}^{r+2} C_2 Z^{r+2} \dots \dots \dots \\ &= Z^r (1 - {}^{r+1} C_1 Z + {}^{r+2} C_2 Z^2 - {}^{r+3} C_3 Z^3 \dots \dots) \\ &= Z^r (1 - Z)^{\overline{-r+1}} = \frac{Z^r}{(1 + Z)^{r+1}} \end{aligned}$$

so that  $\frac{Z^r}{(1 + Z)^{r+1}}$

represents the probability of exactly  $r$  survivors out of  $m$  for all combinations of  $r$  survivors. By converting probabilities to annuities and defining

$$Z^{r+t} = {}^m C_{r+t} {}_{r+t} \bar{a} \text{ we have } \frac{Z^r}{(1 + Z)^{r+1}} = \text{present value of}$$

annuities payable while there are exactly  $r$  survivors of  $m$ .

To derive  $\phi$  proceed as follows:

Let  $\$J$  be the benefit to each of  $m$  persons and let  $\$L$  be the maximum benefit to all. The youngest beneficiary will then draw  $\$J$  as will the next youngest and the third youngest etc. provided  $\$rJ < \$L$ . The  $(r+1)^{st}$  youngest will receive  $\$(L-rJ)$  and the  $\$(r+1)J$  benefits will be reduced  $\$(r+1)J-L$  because of the operation of the maximum. The  $(r+2)^{nd}$  youngest will receive nothing and thus the total benefits are reduced  $\$J$  because of him. For  $y_{r+1}$  and  $y_{r+2}$  the reduction has become  $\$(r+2)J-L$

The value of  $\phi$  is then

$$\phi = \left\{ (r+1)J - L \right\} \frac{Z^{r+1}}{(1+Z)^{r+2}} + \left\{ (r+2)J - L \right\} \frac{Z^{r+2}}{(1+Z)^{r+3}} + \left\{ (r+3)J - L \right\} \frac{Z^{r+3}}{(1+Z)^{r+4}} + \dots$$

This is easily summed by breaking it into two series.

$$\begin{aligned} \phi &= \left\{ (r+1)J - L \right\} \frac{Z^{r+1}}{(1+Z)^{r+2}} \left[ 1 + \frac{Z}{1+Z} + \frac{Z^2}{(1+Z)^2} + \frac{Z^3}{(1+Z)^3} + \dots \right] \\ &+ \frac{J Z^{r+2}}{(1+Z)^{r+3}} \left[ 1 + \frac{2Z}{1+Z} + \frac{3Z^2}{(1+Z)^2} + \frac{4Z^3}{(1+Z)^3} + \dots \right] \\ &= \left\{ (r+1)J - L \right\} \frac{Z^{r+1}}{(1+Z)^{r+2}} \left( 1 - \frac{Z}{1+Z} \right)^{-1} + \frac{J Z^{r+2}}{(1+Z)^3} \left( 1 - \frac{Z}{1+Z} \right)^{-2} \\ &= \left\{ (r+1)J - L \right\} \frac{Z^{r+1}}{(1+Z)^{r+1}} + \frac{J Z^{r+2}}{(1+Z)^{r+1}} \\ &= \left[ \left\{ (r+1)J - L \right\} Z^{r+1} + J Z^{r+2} \right] (1+Z)^{-r+1} \end{aligned}$$

As an example consider Formula IX:

	Benefit	Reduction
1st Youngest Child	\$30	\$ 0
2nd Youngest Child	30	0
3rd Youngest Child	30	23 $\frac{1}{3}$
4th Youngest Child	30	53 $\frac{1}{3}$
etc.		

$L = 66\%$                        $J = 30$

$r = 2$

$$\phi = (23\frac{1}{2} Z^3 + 30 Z^4)(1 + Z)^{-3}$$

From this  $\phi$  function the reduction may be obtained for the formulae tabulated above. Consideration of the maximum does not enter into the derivation of the first six tables. Here the widows benefit is reduced \$10 while she has a dependent child < 18 alive; so that

$$\begin{aligned}\phi(y) &= \frac{10 Z}{1 + Z} + \frac{10 Z^2}{(1+Z)^2} + \frac{10 Z^3}{(1 + Z)^3} + \dots\dots\dots \\ &= \frac{10 Z}{1 + Z} = 10 Z - 10 Z^2 + 10 Z^3 \dots\dots\dots\end{aligned}$$

$Z^r$  for  $r > m$  is undefined, therefore

$${}_1\phi(y) = 10 Z = 10 {}_1\bar{a}$$

$${}_2\phi(y) = 10 Z - 10 Z^2 = 10 ({}_2\bar{a} - {}_2\bar{a})$$

$${}_3\phi(y) = 10 (Z - Z^2 + Z^3) = 10 ({}_3\bar{a} - {}_3\bar{a} + {}_3\bar{a})$$

$${}_4\phi(y) = 10 (Z - Z^2 + Z^3 - Z^4) = 10 ({}_4\bar{a} - {}_4\bar{a} + {}_4\bar{a} - {}_4\bar{a})$$

$${}_5\phi(y) = 10 (Z - Z^2 + Z^3 - Z^4 + Z^5) = 10 ({}_5\bar{a} - {}_5\bar{a} + {}_5\bar{a} - {}_5\bar{a} + {}_5\bar{a})$$

Since  $\phi_w(y) = {}_w\phi(y) + {}_{w-1}\phi(y)$

$$\phi_1(y) = 10 {}_1\bar{a}$$

$$\phi_2(y) = 10 ({}_1\bar{a} - {}_2\bar{a})$$

$$\phi_3(y) = 10 ({}_1\bar{a} - 2 {}_2\bar{a} + {}_3\bar{a})$$

$$\phi_4(y) = 10 ({}_1\bar{a} - 3 {}_2\bar{a} + 3 {}_3\bar{a} - {}_4\bar{a})$$

$$\phi_5(y) = 10 ({}_1\bar{a} - 4 {}_2\bar{a} + 6 {}_3\bar{a} - 4 {}_4\bar{a} + {}_5\bar{a})$$

If we should define  $\Theta$  to be for the remarriage benefit what  $\phi$  is for the annuity benefit,

$$\Theta_1(y) = 20 {}_1\bar{E}$$

$$\Theta_2(y) = 20 ({}_1\bar{E} - {}_2\bar{E})$$

$$\Theta_3(y) = 20 ({}_1\bar{E} - 2 {}_2\bar{E} + 3\bar{E})$$

$$\Theta_4(y) = 20 ({}_1\bar{E} - 3 {}_2\bar{E} + 3 {}_3\bar{E} - 4\bar{E})$$

$$\Theta_5(y) = 20 ({}_1\bar{E} - 4 {}_2\bar{E} + 6 {}_3\bar{E} - 4 {}_4\bar{E} + 5\bar{E})$$

The first set of formulae are

$$I A = \phi_1(y) + \Theta_1(y)$$

$$I B = \phi_2(y) + \Theta_2(y)$$

$$I C = \phi_3(y) + \Theta_3(y)$$

$$I D = \phi_4(y) + \Theta_4(y)$$

$$I E = \phi_5(y) + \Theta_5(y)$$

At first it seems incongruous that we can subtract annuities of varying terms but this is permissible as an example will illustrate. Suppose we start with  $m$  children and consider the terms involving  $r$  survivors which are  ${}_r\bar{a}$  and  ${}_r\bar{E}$ . In  $\Theta$  and  $\phi$  we have  ${}^m C_r$  of these terms and in  ${}_{r-1}\phi$  and  ${}_{r-1}\Theta$  we have  ${}^{m-1}C_r$  of these. The addition of  $y_r$  to the group has increased the number of  ${}_r\bar{a}$  and  ${}_r\bar{E}$  terms by  $({}^m C_r - {}^{m-1}C_r)$  terms and these are the ones where  $y_r$  is the last survivor. Therefore these terms run for  $18-y_r$  years and it is these that are counted in  $\phi_r$  and  $\Theta_r$ .

In the second set of formulae we can use the  $\phi$  function developed above.

	Benefit (No Widow)	Reduction
1st Youngest Child	\$30	0
2nd Youngest Child	30	0
3rd Youngest Child	30	23 1/3
4th Youngest Child	30	53 1/3
etc.		

	Benefit (With Widow)	Reduction
1st Youngest Child	\$20	
2nd Youngest Child	20	3 1/2
3rd Youngest Child	20	23 1/3
4th Youngest Child	20	43 1/3
etc.		

In the first instance  $J = \$30$ ,  $r = 2$ ,  $L = 66\frac{2}{3}$  so that,

$$\begin{aligned}\phi(y) &= (23\frac{1}{3} Z^3 + 30 Z^4) (1 + Z)^{-3} \\ &= 23\frac{1}{3} Z^3 - 40 Z^4 + 50 Z^5 \dots\dots\end{aligned}$$

$${}_1\phi(y) = 0$$

$${}_2\phi(y) = 0$$

$${}_3\phi(y) = 23\frac{1}{3} Z^3 = 23\frac{1}{3} {}_3\bar{a}$$

$${}_4\phi(y) = 23\frac{1}{3} Z^3 - 40 Z^4 = 93\frac{1}{3} {}_3\bar{a} - 40 {}_4\bar{a}$$

$${}_5\phi(y) = 23\frac{1}{3} Z^3 - 40 Z^4 + 50 Z^5 = 233\frac{1}{3} {}_3\bar{a} - 200 {}_4\bar{a} + 50 {}_5\bar{a}$$

and

$$\phi_1(y) = 0$$

$$\phi_2(y) = 0$$

$$\phi_3(y) = 23\frac{1}{3} {}_3\bar{a}$$

$$\phi_4(y) = 70 {}_3\bar{a} - 40 {}_4\bar{a}$$

$$\phi_5(y) = 140 {}_3\bar{a} - 160 {}_4\bar{a} + 50 {}_5\bar{a}$$

In the 2nd instance  $J = \$20$ ,  $r = 1$ ,  $L = 66\frac{2}{3}$

$$\begin{aligned}\phi(xy) &= (3\frac{1}{3} Z^2 + 20 Z^3) (1 + Z)^{-2} \\ &= 3\frac{1}{3} Z^2 + 13\frac{1}{3} Z^3 - 30 Z^4 + 46\frac{2}{3} Z^5\end{aligned}$$

$${}_1\phi(xy) = 0$$

$${}_2\phi(xy) = 3\frac{1}{3} Z^2 = 3\frac{1}{3} {}_2\bar{a}$$

$${}_3\phi(xy) = 3\frac{1}{3} Z^2 + 13\frac{1}{3} Z^3 = 10 {}_2\bar{a} + 13\frac{1}{3} {}_3\bar{a}$$

$$\begin{aligned}{}_4\phi(xy) &= 3\frac{1}{3} Z^2 + 13\frac{1}{3} Z^3 - 30 Z^4 \\ &= 20 {}_2\bar{a} + 53\frac{1}{3} {}_3\bar{a} - 30 {}_4\bar{a}\end{aligned}$$

$$\begin{aligned} {}_5\phi(x'y) &= 3\frac{1}{2} Z^2 + 13\frac{1}{2} Z^3 - 30 Z^4 + 46\frac{2}{3} Z^5 \\ &= 33\frac{1}{2} {}_2\bar{a} + 133\frac{1}{2} {}_3\bar{a} - 150 {}_4\bar{a} + 46\frac{2}{3} {}_5\bar{a} \end{aligned}$$

There we have another seeming incongruity in subtracting terms involving (*y*) from terms involving (*x'y*). Since the  $\phi(y)$  terms are independent of *x'* in deducting those we do so whether or not the widow is alive. If we now deduct again for the case of the widow alive we would be compounding the deduction hence it is necessary to subtract previous deductions of the form  $\phi_w(y)$

$$\phi_1(x'y) = 0$$

$$\phi_2(x'y) = 3\frac{1}{2} {}_2\bar{a}$$

$$\phi_3(x'y) = 3\frac{1}{2} {}_2\bar{a} - 10 {}_3\bar{a}$$

$$\phi_4(x'y) = 10 {}_2\bar{a} - 30 {}_3\bar{a} + 10 {}_4\bar{a}$$

$$\phi_5(x'y) = 13\frac{1}{2} {}_2\bar{a} - 60 {}_3\bar{a} + 40 {}_4\bar{a} - 3\frac{1}{2} {}_5\bar{a}$$

$$\text{Formula IV} = 30 \bar{a}_{y1 : \overline{18-y}|} - 10 {}_1\bar{a}_{x'y : \overline{18-y}|}$$

$$\text{V} = 30 \bar{a}_{y2 : \overline{18-y^2}|} - 10 {}_1\bar{a}_{x'y2 : \overline{18-y^2}|} - \phi_2(y) - \phi_2(x'y)$$

$$\text{IV} = 30 \bar{a}_{y3 : \overline{18-y^3}|} - 10 {}_1\bar{a}_{x'y3 : \overline{18-y^3}|} - \phi_3(y) - \phi_3(x'y)$$

$$\text{VII} = 30 \bar{a}_{y4 : \overline{18-y^4}|} - 10 {}_1\bar{a}_{x'y4 : \overline{18-y^4}|} - \phi_4(y) - \phi_4(x'y)$$

$$\text{VIII} = 30 \bar{a}_{y5 : \overline{18-y^5}|} - 10 {}_1\bar{a}_{x'y5 : \overline{18-y^5}|} - \phi_5(y) - \phi_5(x'y)$$

For Formula IX the  $\phi$  function is

$$\phi = (23\frac{1}{2} Z^3 + 30 Z^4) (1 + Z)^{-3}$$

$$\phi(y) = 23\frac{1}{2} Z^3 - 40 Z^4 + 50 Z^5 - 53\frac{1}{2} Z^6 + 50 Z^7 \dots \dots$$

$${}_1\phi(y) = 0$$

$${}_2\phi(y) = 0$$

$${}_3\phi(y) = 23\frac{1}{2} Z^3 = 23\frac{1}{2} {}_3\bar{a}$$

$${}_4\phi(y) = 23\frac{1}{3} Z^3 - 40 Z^4 = 93\frac{1}{3} {}_3\bar{a} - 40 {}_4\bar{a}$$

$$\begin{aligned} {}_5\phi(y) &= 23\frac{1}{3} Z^3 - 40 Z^4 + 50 Z^5 \\ &= 233\frac{1}{3} {}_3\bar{a} - 600 {}_4\bar{a} + 50 {}_5\bar{a} \end{aligned}$$

$$\begin{aligned} {}_6\phi(y) &= 23\frac{1}{3} Z^3 - 40 Z^4 + 50 Z^5 - 53\frac{1}{3} Z^6 \\ &= 466\frac{2}{3} {}_3\bar{a} - 600 {}_4\bar{a} + 300 {}_5\bar{a} - 53\frac{1}{3} {}_6\bar{a} \end{aligned}$$

$$\begin{aligned} {}_7\phi(y) &= 23\frac{1}{3} Z^3 - 40 Z^4 + 50 Z^5 - 53\frac{1}{3} Z^6 + 50 Z^7 \\ &= 716\frac{2}{3} {}_3\bar{a} - 1400 {}_4\bar{a} + 1050 {}_5\bar{a} - 373\frac{1}{3} {}_6\bar{a} + 50 {}_7\bar{a} \end{aligned}$$

and

$$\phi_1(y) = 0$$

$$\phi_2(y) = 0$$

$$\phi_3(y) = 23\frac{1}{3} {}_3\bar{a}$$

$$\phi_4(y) = 70 {}_3\bar{a} - 40 {}_4\bar{a}$$

$$\phi_5(y) = 140 {}_3\bar{a} - 160 {}_4\bar{a} + 50 {}_5\bar{a}$$

$$\phi_6(y) = 233\frac{1}{3} {}_3\bar{a} - 400 {}_4\bar{a} + 250 {}_5\bar{a} - 53\frac{1}{3} {}_6\bar{a}$$

$$\phi_7(y) = 350 {}_3\bar{a} - 800 {}_4\bar{a} + 750 {}_5\bar{a} - 320 {}_6\bar{a} + 50 {}_7\bar{a}$$

For Formula IX-A

$$\begin{aligned} \phi &= (8\frac{1}{3} Z^3 + 25 Z^4) (1 + Z)^{-3} \\ &= 8\frac{1}{3} Z^3 - 25 Z^5 + 66\frac{2}{3} Z^6 - 125 Z^7 + \dots \end{aligned}$$

$${}_1\phi(y) = 0$$

$${}_2\phi(y) = 0$$

$${}_3\phi(y) = 8\frac{1}{3} Z^3 = 8\frac{1}{3} {}_3\bar{a}$$

$${}_4\phi(y) = 8\frac{1}{3} Z^3 = 33\frac{1}{3} {}_3\bar{a}$$



$${}_5\phi(y) = 8\frac{1}{2} Z^3 - 25 Z^5 +$$

$${}_6\phi(y) = 8\frac{1}{2} Z^3 - 25 Z^5 + 66\frac{2}{3} Z^6$$

$${}_7\phi(y) = 8\frac{1}{2} Z^3 - 25 Z^5 + 66\frac{2}{3} Z^6 - 125 Z^7$$

$$\phi_1(y) = 0$$

$$\phi_2(y) = 0$$

$$\phi_3(y) = 8\frac{1}{2} {}_3\bar{a}$$

$$\phi_4(y) = 25 {}_3\bar{a}$$

$$\phi_5(y) = 50 {}_3\bar{a} - 25 {}_5\bar{a}$$

$$\phi_6(y) = 88\frac{1}{2} {}_3\bar{a} - 125 {}_5\bar{a} + 66\frac{2}{3} {}_6\bar{a}$$

$$\phi_7(y) = 125 {}_3\bar{a} - 375 {}_5\bar{a} + 400 {}_6\bar{a} - 125 {}_7\bar{a}$$

Formulae X and XI follow from the definitions of the benefits they value. Formulae XVI, XVII, XVIII, XIX, XX are similar to Formula I combined with Formulae I-A, I-B, I-C, I-D and I-E. The derivation is the same except that the term is common for all rather than varying according to the age of each child.

It is believed that this paper is sufficiently self-contained that the reader will be enabled to understand the latest application of life contingencies in the Casualty Actuarial field. An index of commutation and other symbols is appended for the use of those who may wish to develop these formulae from first principles.

INDEX OF SYMBOLS AND COMMUTATIONS USED IN  
FORMULAE FOR RECOMPUTED WORKMEN'S  
COMPENSATION TABLES

$l_x$	The number alive and unmarried at precise age $x'$ who according to the Danish Survivorship Annuitants' Table of Mortality and according to the Remarriage Tables, terminating at age 65, of the Dutch Royal Insurance Institution are the unmarried survivors of those alive and unmarried at age $x'-1$ .
$v$	The present value of \$1 due one year hence at 3% compound interest.
$m_x$	The number remarrying between ages $x'$ and $x'-1$ and alive at age $x'+1$ .

$$\bar{C}_{x'} = v^{x'+\frac{1}{2}} \left( \frac{m_{x'}}{1 - \frac{1}{2}q_{x'}} \right)$$

$$\bar{M}_{x'} = \sum_{x'=x'}^{x'=\infty} \bar{C}_{x'}$$

$$D_{x'} = l_{x'} v^{x'}$$

$$\bar{D}_{x'} = \frac{D_{x'} + D_{x'+1}}{2}$$

S = .99479364, the probability of a child age 17 or under living one year.

$${}_w D_{x'} = S_{w-1}^{x'} D_{x'}$$

$${}_w \bar{C}_{x'} = S^{x'+\frac{1}{2}} {}_{w-1} \bar{C}_{x'}$$

$${}_w \bar{D}_{x'} = \frac{{}_w D_{x'} + {}_w D_{x'+1}}{2}$$

$${}_w \bar{N}_{x'} = \sum_{x'=x'}^{x'=\infty} {}_w \bar{D}_{x'}$$

$${}_w \bar{M}_{x'} = \sum_{x'=x'}^{x'=\infty} {}_w \bar{C}_{x'}$$

$\bar{a}_{x'}$  The value of \$1 per year payable continuously commencing at age  $x$  and continuing as long as  $x'$  lives =  $\frac{\bar{N}_{x'}}{D_{x'}}$

$\bar{a}_{y : \overline{18-y}|}$  The value of \$1 per year payable continuously commencing at age  $y$  and continuing to age 18.

${}_w \bar{a}_{x'y_w : \overline{18-y_w}|}$  The value of \$1 per year payable continuously during the joint lives of a widow age  $x'$  at date of valuation and  $w$  children of which the oldest is age  $y_w$  for  $18-y_w$  years.

$$= \frac{{}_w\bar{N}_{x'} - {}_w\bar{N}_{x'+18-y_w}}{{}_wD_{x'}}$$

$\bar{E}_x$  The value of \$1 payable in a lump sum upon remarriage of a widow age  $x'$  at date of valuation.

$$\frac{\bar{M}_{x'}}{D_{x'}}$$

${}_w\bar{E}_{x':y_w: \overline{17-y_w}}$  The value of \$1 payable in a lump sum upon the remarriage of a widow, age  $x'$  at date of valuation, with  $w$  children, of which the oldest is age  $y_w$  within  $18-y_w$  years, if all  $w$  children are alive at time of marriage.

$$= \frac{{}_w\bar{M}_{x'} - {}_w\bar{M}_{x'+17-y_w}}{{}_wD_{x'}}$$

## REPORT OF COMMITTEE ON COMPENSATION AND LIABILITY LOSS AND LOSS EXPENSE RESERVES

During the past few years considerable dissatisfaction has been expressed, publicly and privately, with regard to the Schedule P method of establishing and exhibiting compensation and liability loss and loss expense reserves for annual statement purposes.

One source of such dissatisfaction is in the utilization of the Schedule P "remainder" as a minimum reserve for each of the three latest policy years. A special section of this report deals with the whole question of minimum reserves, with particular reference to the appropriateness of the Schedule P method.

Another important source of dissatisfaction lies in the lack of information as to the constituent elements of the case estimate total. The scrutiny of an individual carrier's annual statement does not indicate whether provision has been made for unreported claims and the amount of such provision, whether provision has been made for outstanding loss expense and the amount of such provision, whether a reserve for undisclosed occupational disease claims has been included and the amount of such reserve, etc. The present annual statement schedules are so unsatisfactory in this regard that certain carriers have themselves modified the method of exhibiting loss and loss expense reserves. For example, certain carriers set up separate reserves for loss expenses and deduct these amounts from the Schedule P "equity", if any. It is quite obvious from the foregoing brief discussion that there is an almost utter lack of uniformity in treatment, most of which is directly attributable to the deficiencies in the annual statement schedules themselves.

Before proceeding with its report, the Committee is first recording the five fundamental principles laid down by the previous Committee (*Proceedings* -Volume XVII), together with the present Committee's comments thereon.

1. The loss reserve should be based solely upon claims (and medical) excluding loss expense. Comment: The Committee is in entire agreement with this principle.
2. The loss reserve should be based upon individual estimates of outstanding claims (and suits). Comment: The Committee is in agreement with this principle but would substitute "individual estimates (or their equivalent)" for "individual estimates".
3. A minimum reserve based upon a pure loss ratio check should be applied for losses under policies issued in the three latest policy years. Comment: The Committee is in disagreement with this principle, particularly in view of developments during the intervening years, as will be commented upon more fully subsequently in this report.
4. A reserve for a loss expense (both allocated and unallocated), to be determined by formula, should be set up on the "Liabilities" page of the annual statement. Comment: The Committee is in agreement with this principle, except for the determination of such reserves by a single set of formulae applied to all carriers.

5. Schedules for showing the policy year average paid and incurred costs per accident and developments of policy year incurred losses by calendar year should be provided as a check upon the accuracy of reserves and to enable companies to determine loading factors to be applied to incurred or outstanding losses where experience indicates that such a course is necessary. Comment: The Committee is in agreement with this principle insofar as it relates to the development of incurred losses, as exemplified by the present Parts 5 and 5A of Schedule P.

#### MINIMUM RESERVES — SCHEDULE P

The establishment of appropriate reserves for liability and workmen's compensation losses has been a major problem ever since the origin of these lines of business. During the early years, loss reserves estimated on a case basis were occasionally found to be under-estimated. In an effort to remedy this situation, certain standards were established which for the most part provided for setting up minimum reserves of a fixed percentage of earned premiums less losses and loss expenses paid for certain policy years. At the present time for each of the three latest policy years, the higher amount is taken as between the aggregate of case estimates and the amount remaining after deducting loss and loss expense payments from stipulated percentages (60 per cent. for liability and 65 per cent. for compensation) of earned premiums. In other words, for reserve purposes, minimum combined loss and loss expense ratios are assumed for each of the three latest policy years for the respective lines.

The members of the Society are familiar with the criticism leveled at the Schedule P method of establishing minimum reserves. Much of this criticism deals with the appropriateness of the premium base, i.e., the inadequacy of the assumed loss ratio due to: deviations from standard rates, retrospective rating, Massachusetts compulsory coverage, inadequate deposit premiums, etc. There is an inherent difficulty in satisfactorily defining a "standard" premium for minimum reserve purposes, not to mention the expense and time delay of compiling such standard premiums if a satisfactory definition could be found. This difficulty will undoubtedly increase in the future, particularly with the growth of "all-inclusive" policies. In fact, certain carriers are already writing automobile insurance with a single premium for both bodily injury and property damage coverages, so that the problem is no longer academic. The Committee believes that even at the present time it is impossible to utilize a premium base satisfactorily.

Another factor which deserves mention is the fact that the present Schedule P method gives distorted loss ratio and earnings results. A currently bad underwriting situation can be completely counteracted by a reserve release from a prior and favorable loss ratio year. This objection is not peculiar to the present Schedule P method but is inherent under any minimum reserve requirements.

It seems to the Committee that the intended purposes of minimum reserves should be fundamentally re-examined. Undoubtedly the chief purpose of minimum reserves is to guarantee adequate reserves. After careful study,

the Committee has concluded that this purpose cannot be met by the present Schedule P method or any other formula method for establishing minimum reserves. In actual practice, it is believed that the present Schedule P method has not succeeded in preventing or reducing losses to policyholders when carriers have become insolvent. The loss elements which make for insolvency are the same elements which make a minimum reserve method inoperative. The only positive accomplishment of the present Schedule P method appears to be to penalize the surplus of companies having better than average loss ratios.

The Committee has given considerable thought to the question of minimum reserves and has reached the conclusion that the problem is really one of reasonably *adequate* reserves and that formula methods are not a solution. The Committee believes that appropriate statistical indications provide a better approach to the problem.

#### COMPENSATION LOSS RESERVES

Recently a suggestion has been advanced for building a minimum reserve by applying standard table values to the aggregate weekly indemnity and numbers of cases of outstanding losses grouped according to elapsed duration. (*Proceedings*-Volume XXXIII.) In this article there is pointed out the weakness of the present Schedule P loss ratio basis of establishing minimum reserves in a period when the graduation of expenses by size of risk is assuming greater importance. Obviously, a basis of minimum reserves which is independent of premium would avoid this difficulty.

The Committee has given careful consideration to this plan from the standpoint of reasonably *adequate* rather than *minimum* reserves. The conclusion was reached that since the effective field for the operation of the standard reserve table method narrows down to a small fraction of the total liability for unpaid losses, the additional work involved in imposing an additional reserve system would not be justified.

In the course of its deliberations, the Committee became convinced of the possibility of reasonably determining the aggregate reserve for known cases based on the individual circumstances of each case. The necessity and importance of assigning and maintaining a proper estimate of total cost to each individual compensation case prior to its termination is kept constantly before the carriers because of the demands for such data for unit reports, experience rating, retrospective rating, contingent commission arrangements, agency and branch office records and risk underwriting records.

Since the liability for outstanding losses on known cases represents the bulk of any estimate of the aggregate liability for unpaid compensation losses and if, as the Committee believes, the outstanding losses on known cases can be determined with reasonable accuracy, this provides a good foundation upon which to build the complete loss reserve. There, of course, must be added to the reserve for known cases, supplementary reserves for less definite liabilities, such as reserves for incurred but not reported cases, reopened cases, adverse developments, and occupational disease accrued liability. In the establishment of these supplementary reserves, each carrier

must be guided by its own experience, because of marked differences in claim administration practice.

After the aggregate reserve has been established on the foregoing basis, there remains the question of a reasonable test of adequacy. While the method of averages per reported claim is undoubtedly useful for an individual company, the Committee discarded it for standard test purposes since counts are not uniformly made by all carriers and difficulty would probably be experienced in completing the count at an early date. Moreover, changes in coverage and in claim administration may from time to time influence the definition and cost of a reported claim.

In its search for a more dependable test of adequacy, the Committee selected the rate of payment of compensation losses (indemnity and medical combined) as a satisfactory yardstick with relatively few statistical disadvantages. The rate of payment of compensation losses is largely dictated by statute and the desire of carriers to discharge their obligations promptly. The consistency in the rate of compensation loss payments may be coupled with the stability of the successive valuations of accident year incurred losses, as presently displayed in Schedule P, Part 5A, to provide a simple reserve test. It is believed that an exhibit which shows the percentage of incurred losses (latest valuation) which has been paid at annual intervals for each of several recent accident years will furnish a satisfactory means of testing the adequacy of current reserves.

Barring unusual circumstances, the ratio of paid to incurred for any accident year should bear a close resemblance to the corresponding ratio for previous years at a similar stage of development, providing the incurred losses include reserves for outstanding losses which have been consistently estimated. In those instances where a material variation is noted, a satisfactory explanation should be found for the departure or else the inference is that the difference has resulted from a change in the degree of adequacy of the outstanding losses included in the incurred losses.

Exhibit A is a modification of the present Schedule P, Parts 5 and 5A, embodying an exhibit of accumulated paid losses by accident year at successive year-ends. Provision is included for showing the ratio of the compensation paid amounts to the amount of incurred losses as of the latest December 31, the statement date. The outstanding losses as of statement date are also displayed by accident year. The total of this column will agree with the amount shown on the liabilities page of the annual statement. The right-hand section of Exhibit A is composed of data essentially the same as that now required by Schedule P, Parts 5 and 5A, except that the analysis by policy year of the present schedule has been omitted as no longer essential.

Summarizing the Committee's recommendations as respects the reserves for compensation losses, it is advocated that the loss reserve be composed of the aggregate of individual estimates of known cases plus the supplementary reserves to which reference has been previously made. The introduction of a schedule similar to Exhibit A as a part of the annual statement requirements will provide a statistical signal indicating any marked variation from previous experience trends.

### AUTOMOBILE BODILY INJURY LIABILITY LOSS RESERVES

As with compensation, the Committee believes that it is possible to determine reasonably the aggregate reserve for known cases based on the individual circumstances of each case. Here, also, it is necessary and important to assign and maintain a proper estimate of total cost to each individual case because of the demands for such data for internal and external statistical compilations. With the addition of supplementary reserves, such as reserves for incurred but not reported cases, reopened cases, and adverse developments, there remains the question of a reasonable test of adequacy of the aggregate reserve thereby produced.

In its search for a dependable test of adequacy, the Committee was forced to recognize that for theoretical reasons, a relatively simple test similar to that devised for compensation, even with the utilization of the number of notices, would not be sound. Unlike compensation, in automobile liability insurance, the rate of payment is not dictated by statute; rather, business judgment dictates variations in the rate at which cases are settled. Secondly, and at times of even greater importance, inflationary trends result in higher average costs per case by settlement date. While the Committee believes that individual carriers should be encouraged to maintain their own statistical controls on rate of liquidation and average cost per case and to utilize them fully in establishing adequate reserves on individual cases, it does not believe that it is feasible to devise a test based thereon for uniform application to all carriers.

The Committee accordingly concluded that the same form of reporting as is being recommended for workmen's compensation (Exhibit A) should be recommended for automobile liability reserves, with the omission of the ratios of the paid amounts to incurred losses.

### BODILY INJURY LIABILITY OTHER THAN AUTOMOBILE RESERVES

With regard to liability other than automobile, the problem is even more difficult than automobile liability since the business written by various carriers is not sufficiently homogeneous to permit generalizations. Moreover, changes in the distribution of business by coverage within a carrier from one year to the next can easily render ineffective any statistical tests which might be devised.

The Committee merely directs attention to the circumstance that while the problem of evaluating a reserve established by a carrier for the liability other than automobile lines is a difficult one, its importance is considerably less than that of compensation and automobile. Except for a limited number of specialty carriers, the reserve for liability other than automobile will be, in general, a relatively small part of the total reserve for all lines.

The Committee accordingly recommends that the same procedure be followed as with automobile liability and that the results be similarly exhibited in Exhibit A.

### LOSS EXPENSE RESERVES

The present Committee agrees with its predecessor that separate reserves for compensation and liability loss adjustment expense would be set up on



the liabilities page of the annual statement, but does not feel that any uniform formula would produce reasonable and adequate results for all companies. The Committee recommends, rather, that companies be permitted to establish these reserves by their own methods. There seem to be no particularly impelling reasons why loss adjustment expense reserves on liability and compensation should be singled out and given different treatment from that accorded similar reserves for the other lines of business.

There is far too much variation between companies as to loss adjustment costs to warrant a uniform formula. Reference to the Casualty Insurance Expense Exhibit reveals that for the year 1947 the ratio of "claim expenses" incurred to premiums earned varied from 6.5% to 14.5% for automobile liability and from 2.8% to 12.3% for workmen's compensation, as between individual companies writing at least \$1,000,000 of premiums in each case. Nor is this the result of wide variation in loss experience for these same figures converted to percentages of losses incurred show a variation from 13.5% to 27.3% for automobile liability and from 4.6% to 22.1% for workmen's compensation.

The Committee believes that reserves for loss adjustment expense should be set up on the basis of a company's own experience and judgment. As with other lines of insurance, the Committee feels that a check of the method followed in arriving at such reserves is properly the concern of periodical Insurance Department examination.

#### RECOMMENDATIONS

Based for the most part upon the foregoing, the Committee's recommendations are as follows:

1. Separate reserves for losses and loss expenses should be carried for compensation, automobile bodily injury liability, and bodily injury liability other than automobile, respectively.
2. The reserve for compensation, automobile bodily injury liability, and bodily injury liability other than automobile losses, respectively, should be shown in the same detail as for other lines, i.e., broken down as between reported and unreported with a further indication on compensation as to how much of the unreported reserve consists of a reserve for undisclosed occupational disease claims.
3. The reserve for losses should be based upon individual estimates of claims (and suits) or their equivalent.
4. The reserve for loss expense (allocated and unallocated) should be based upon the anticipated expense of the individual carrier.
5. The present Schedule O should be expanded by the addition of lines for compensation, automobile bodily injury liability and bodily injury liability other than automobile, respectively.
6. Except for Parts 5 and 5A, which would be continued in revised form as the proposed Exhibit A, the present Schedule P should be discontinued.

\* \* \* \* \*

With the probability that major changes in the annual statement blank may occur in the near future as a result of the proposed new blank for fire and casualty companies, or as a result of studies now in progress by the Committee on Uniform Accounting of the National Association of Insurance Commissioners, the Committee believes that the present time is particularly appropriate to consider the subject matter of this report. It is quite obvious that the blank may be greatly simplified if the determination of loss adjustment expense (in total or by line of insurance) is deferred for inclusion with the subsequently filed Insurance Expense Exhibit.

The point may be raised, as it was when the previous Committee reported, that the proposed changes are not in conformity with the present loss reserve requirements embodied in the statutes of certain states. Here, the present Committee can only reiterate what the previous Committee stated, that is, that it "feels that its problem is to determine proper reserve bases regardless of existing statutes".

HARMON T. BARBER  
JOHN W. CARLETON  
HOWARD G. CRANE  
NORTON E. MASTERSON  
VICTOR MONTGOMERY  
DUDLEY M. FRUITT  
JOSEPH LINDER, *Chairman*

## DEVELOPMENT OF LOSSES

EXHIBIT A

## COMPENSATION

Acc. Year	Accumulation of Paid Losses at end of:										Outstanding 12/31/49	Incurred Losses at end of:					Acc. Year
	1st Yr.	%*	2nd Yr.	%*	3rd Yr.	%*	4th Yr.	%*	5th Yr.	%*		1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	
Prior	x		x		x		x		x			x	x	x	x	Prior	
1945																1945	
1946									x						x	1946	
1947							x		x					x	x	1947	
1948					x		x		x				x	x	x	1948	
1949			x		x		x		x			x	x	x	x	1949	
Total												Total					

\* Percentage of Paid to incurred as of December 31, 1949.

## AUTOMOBILE LIABILITY

Acc. Year	Accumulation of Paid Losses at end of:					Outstanding 12/31/49	Incurred Losses at end of:					Acc. Year
	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.		1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	
Prior	x	x	x	x	x		x	x	x	x	x	Prior
1946												1945
1946												1946
1947					x							1947
1948				x	x					x	x	1948
1949		x		x	x					x	x	1949
Total							Total					

## LIABILITY OTHER THAN AUTOMOBILE

Acc. Year	Accumulation of Paid Losses at end of:					Outstanding 12/31/49	Incurred Losses at end of:					Acc. Year
	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.		1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	
Prior	x	x	x	x	x		x	x	x	x	x	Prior
1945												1945
1946												1946
1947					x					x	x	1947
1948				x	x					x	x	1948
1949		x		x	x					x	x	1949
Total							Total					

REPORT OF COMMITTEE ON COMPENSATION AND LIABILITY  
LOSS AND LOSS EXPENSE RESERVES

## WRITTEN DISCUSSION

RUSSELL P. GODDARD

The committee has attacked a problem which has been in need of study for many years. In view of the importance of the problem, it would be advisable to have the report well buttressed with answers to the questions which will be raised and criticisms which will be leveled at any change from our present Schedule P. The following objections are some of those which are bound to arise in the course of the consideration of the report by insurance commissioners and others interested in the solvency of insurance companies. It is not assumed that these points have not been thoroughly considered by the committee, but it is felt that discussion at this point of time may be made in anticipation of similar discussions later on.

- (1) The report gives scant attention to the reserve problem for new insurance companies for which ratios of paid-to-incurred losses can not be determined. Presumably the present reserve methods are unsatisfactory when applied to new, and comparatively new companies, but it might be well to have a frank discussion of the inadequacies of any arbitrary tests of reserves for this class of carrier.
- (2) For well established companies the ratios of paid-to-incurred are relatively stable and there may be a danger that too much reliance may be placed on the control values of these ratios. This is particularly true, of course, for immature policy years for which the amount of outstanding loss reserve is largest.
- (3) The use of paid-to-incurred ratios as a test assumes a fairly constant proportion of long-term cases. These ratios may prove misleading in the event that something has happened to change this proportion, such as the passage of law amendments increasing the term of death or permanent total cases, or if the particular company has entered a new state with a higher proportion of such cases than other states in which the company previously operated, or if on the other hand the company has been able to adopt a program of settling such cases by lump sums.

It is felt that a discussion of these items will smooth the course of the committee report after it leaves the pages of the *Proceedings*.

## REPORT OF COMMITTEE ON COMPENSATION AND LIABILITY LOSS AND LOSS EXPENSE RESERVES

### WRITTEN DISCUSSION

J. C. MONTGOMERY

The Committee's report focuses attention at a particularly opportune moment on what is perhaps the most troublesome problem facing casualty companies today in the preparation of their annual statements, that is, the question of establishing for Compensation and Liability lines loss and loss expense reserves that will be adequate but not excessive, with the added objective of segregating these two types of liabilities so that their corresponding items of losses and loss expenses incurred will be properly reflected in the Underwriting Exhibit. The subject is equally important to the companies from the standpoint of their internal exhibits, including data on branch and agency loss ratios, profit sharing statements, classification and other rating filings, and other procedures involving the use of case estimates on open claims.

Irrespective of the merits or defects of Schedule "P" versus other possible loss reserve substitutes, every effort should be made, as the report suggests, to eliminate the existing confusion caused by the fact that the present formula loss reserve includes the element of unpaid loss expense. A separation into the two elements could readily be accomplished in one of several ways, that is, by distinct calculations, or by changing the framework of present Schedule "P", or by a supplemental schedule in which to indicate the portion of the reserve required for loss expense. To go a step further, should the sum of the expense reserve plus the total of case estimates, including therein provision for incurred but not reported, be exceeded by the Schedule "P" formula reserve, the differences might also be stated separately as a "contingent loss reserve" under liabilities on page 5 and treated as a charge against surplus in the miscellaneous section of the Underwriting and Investment Exhibit on page 9. (A similar principle is already recognized in the Casualty Expense Exhibit, which provides for an adjustment item at line 48 representing the difference between the company's estimates and the statutory reserve.) A three-part reserve of this nature, which would not lessen the basic control through minimum reserves now exercised by Insurance Departments, is sound from an accounting standpoint and should not be too difficult to incorporate in existing reserve laws by amendments, if such be necessary.

The establishment of case estimates of guaranteed adequacy for actual losses only, whether for Schedule "P" purposes or, in lieu thereof, an independent case estimate reserve increased by factors for incurred but not reported cases, is, for the reasons cited by the Committee, the far more difficult problem. This is particularly true today as respects the proper valuation of third party bodily injury claims under inflationary conditions that make data on closed cases of dubious current value, either in the mind of the examiner reviewing each claim or for determining averages per case, per-

centages of ultimate costs, or similar bases discussed as possible substitutes for the "minimum reserve" principle. The situation 18 years ago, when the previous Committee reported, was relatively stable as respects damage values. A competent claims man could estimate his reserves on the basis of his past experience and, in the aggregate, come reasonably close; today, not only are basic values distorted but jury verdicts for bodily injuries are frequently for fantastic amounts that are unpredictable. This naturally makes the reserve problem that much more important but correspondingly more difficult of solution.

It appears undeniable that in an inflationary period, when adequate reserves are so vital, there seems to be no single yardstick that can be used by the majority of companies to measure with any consistency the adequacy of their case estimate totals for third party bodily injury claims. This difficult situation is aggravated by the disproportionate growth in recent years of "incurred but not reported" losses caused to some extent by personnel difficulties in the field and home offices. Periodical reserve tests, though advisable, are of limited value since they suffer, in only lessening degree, from the weaknesses inherent in their original reserves, until the number of tested cases still outstanding has become a relatively small proportion of the total, by which time economic and personnel conditions may have further changed and conclusions based thereon consequently subject to question. Thus, in the last analysis, we find ourselves dependent upon the claims examiner's judgment as a base against which some precaution must be established and maintained until the actual ultimate costs or a close approximation thereof can be determined. Schedule "P" provides only the imperfect protection of a minimum reserve, it is true, and can be criticized in several respects, but it does have the definite advantage that its control is predicated upon the total of each policy year's expected losses rather than outstanding cases only, and thus it operates to restrain a company from taking what might prove mistaken advantage of apparently subnormal losses. Tying up potential profit this way is, naturally, more inconvenient to the small or weaker company, while from the viewpoint of the large, well capitalized company an objection might be raised concerning the size of the sums unnecessarily restricted; the fact is, however, that in the one case such protection for the benefit of the public is obviously essential, while in the other, the situation is hardly likely to represent a serious hardship.

Granting that the various criticisms concerning the effects of Schedule "P" on current loss ratios and earnings are justified, it can however be argued that since these distortions can be removed by appropriate revision of the Schedule, they do not constitute sufficient reason for entirely discarding the minimum reserve principle. To say that the chief purpose of minimum reserves is to guarantee adequate reserves is a rather broad assumption. A minimum reserve can be only a measure of protection, hardly a guarantee. Moreover, it is a measure that can readily be increased where necessary, a remedy that it considerably easier to apply and to diagnose more promptly the need thereof under Schedule "P" than might otherwise be possible, because of the variations to which the individual carrier's loss development trends are subject. These variations, of course, would naturally

be more pronounced in medium or small companies due to the fluctuating incidence of very large claims. The effect of a company's net retention on such claims suggests further possibilities of distortion in projecting an estimated reserve based on the rate of payment.

While the present and previous Committee have made it clear that their objectives are adequate reserves without regard to existing State law requirements, the fact remains that the eventual solution must be one that either meets those requirements or can be woven into amendments thereof that will maintain the controls desired by Insurance Departments. It must, moreover, be based upon data that can be readily audited by Insurance Department examiners in checking the annual statement. The principal, possibly the only, virtue of Schedule "P" may be that it permits this check while maintaining a degree of safety through the minimum reserve principle, and though admittedly the value thereof is lessened by the influence of varying rate levels or rating plans used by some carriers, its importance cannot lightly be dismissed without offering a substitute that embodies equal protection and ease of verification. The annual statement is after all the only practical means by which Insurance Departments can maintain financial supervision of carriers between examinations. It is prepared primarily for that purpose, and while Schedule "P" cannot alone guarantee solvency, it is hardly probable that reserves predicated upon a company's own limited data would be any more successful in that respect.

Concerning recommendation 2, it seems questionable whether a breakdown as between reserves for reported and unreported cases would actually prove useful, either for purposes of comparison with prior years or with other companies. Conditions within many companies, such as current status of clerical work, territorial distribution of business, closing dates, etc., vary from year to year and, accordingly, variations in very carefully calculated reserves could very well be misunderstood by others not familiar with the facts. Certainly, the company itself will want to analyze its reserve developments by reported and unreported, but if the over-all reserve proves consistently adequate, that fact should be sufficient for annual statement purposes.

In any event, if the Committee's recommendation to segregate losses from loss expense in the reserve calculation could be adopted, with possibly a further provision for treating, as a separate liability, the excess of formula reserve over reserves based on case estimates and the reserve for loss expense, one worthy objective would be accomplished as respects clarifying the presentation of financial statement data and operating results while the search is continued for a solution to the problem of establishing loss reserves on a basis that will be satisfactory to the companies and the supervising authorities as well.

REPORT OF COMMITTEE ON COMPENSATION AND LIABILITY  
LOSS AND LOSS EXPENSE RESERVES

## WRITTEN DISCUSSION

F. S. PERRYMAN

This report is of very great importance, not only as respects the existing unsatisfactory state of affairs in regard to Schedule P but also in respect of the very sound suggestions advanced by the Committee to cure the present situation. The present state of affairs as to the treatments of reserves for Liability and Compensation insurance in the annual statement is so confused and so out of date that those of us whose job it is to deal with these matters are apt to take it for granted that everyone else is also fully convinced of the need for reform and, if I may make one comment on the report (a criticism, if you will, of omission rather than of commission) it is that the report may well have been amplified as to the reasons for the unsatisfactory nature of the present Schedule P methods. The report should contain the whole story since, before its recommendations can be carried out, it will be necessary to convince not only carriers and company officials, Insurance Department Commissioners and personnel but also, in many instances, legislators.

As to the remedies proposed by the Committee, I am fully in sympathy with them. It is, to my mind, of the utmost importance that steps along the lines advocated by the Committee be taken to cure the present confusing and anachronistic situation. I would have been among the first to take strong issue with the Committee had they not faced the issue squarely and had they not advocated a straight-forward principle that reserves should be established for: (a) known cases; (b) cases which have been incurred but which are not yet known to the companies; (c) expenses of settling outstanding liabilities; and (d) reserves for any other contingencies arising out of these lines of business. Since, as I said, I would have been quick to have taken issue with any less direct and proper approach, I should, in all fairness, add my testimony to the soundness of the conclusions and suggestions of the Committee.

Strictly speaking, the annual statement should be an exhibit of the financial condition of the company and any test as to the soundness of the reserves carried, or, for that matter, any other figures, should play only a secondary role in the statement. However, such information, though secondary, is not unimportant. The test of reserves proposed by the Committee can only be regarded as tentative and will probably be so regarded by the Committee. From time to time, doubtless, improvements in this test of reserves may be effected but it must be remembered that all such tests, coming as they do after the event, are rarely conclusive but only indicative as to the current financial situation of the company. There is no substitute for good management and good faith.



REPORT OF COMMITTEE ON COMPENSATION AND LIABILITY  
LOSS AND LOSS EXPENSE RESERVES

## WRITTEN DISCUSSION

T. F. TARBELL

The expected loss ratio method of determining loss (and loss expense) reserves as illustrated by "Schedule P" unquestionably served a useful purpose in the earlier years of the present century, particularly as respects the determination of adequate, or reasonably adequate, reserves for the various liability coverages. Its value in establishing proper or even adequate, reserves for the Compensation line, except for a short period following the general enactment of Compensation Acts, has in the mind of the writer been open to question.

The Committee is to be congratulated on its thorough study of the subject and its sound conclusions and recommendations. The writer subscribes to the same without reservations. He concurs that the schedule has outlived its practical usefulness and under present conditions results in distortions of underwriting and surplus results and confusion as respects basis of taxation of profits under the Federal Income Tax Law.

Let us review the record.

At the time Schedule P was first introduced into the statement it applied, of course, to Liability only as the date was several years prior to the enactment of Compensation Laws. In the early days of Compensation the Schedule was extended to embrace both lines but after a few years, around 1915, separate schedules were provided for each line.

There was justification, if not need, for such a method of determining reserves in the period prior to the general enactment of Compensation laws. The major part of Liability business written by the Casualty Companies was Employers Liability and the old common law defenses were available to the Employer (and his insurer). Under such conditions the problem of estimating a company's liability for unsettled claims was naturally a difficult one and the requirement of a minimum reserve based upon a theoretical loss ratio was logical.

Since the early days, so to speak, conditions have changed materially, particularly as respects Liability insurance. The public has become more aware of its legal rights in event of injury for which another is responsible, or alleged to be responsible, or, to use a more general term, has become increasingly claim conscious. The universal use of the Automobile has no doubt been the major contributing factor to this condition. The point of this is that the determination of claim reserves does not, on the average at least, involve the elements of uncertainty existing under conditions of thirty to forty years ago.

Turning to Compensation we must also admit that in the early days, roughly from 1913 to about 1918, there was justification for a loss ratio reserve basis. However, as benefits became more or less standardized through legal interpretations and awards, the problem of determining adequate reserves for individual claims became greatly simplified.

At this point it might be appropriate to emphasize that for many years the formula reserve for Compensation has been inoperative as it applies to the latest year of issue, due, of course, to the fact that a very considerable portion of premium actually earned under the exposure for that year is not determined and charged until the following calendar year. The amount of the "back-log" may be affected and vary with economic, or general business, conditions as respects policies subject to annual audit, but it is an ever present substantial factor under policies subject to periodical audit. This "back-log" is not restricted to the latest year of issue but also affects the previous year of issue. No practical method of overcoming this condition has ever been suggested. In the opinion of the writer the problem is not susceptible of satisfactory solution.

One test of the value of the present Schedule is its effectiveness in preventing insolvency. Possibly it has had some value in this respect but the writer is not aware of any instances. If a company in questionable financial condition is desirous of concealing the same there are other, and probably easier, avenues of approach. The oft repeated commonplace "You can't legislate honesty" might be paraphrased in the present instance to "You can't design a statement which cannot be circumvented."

The greatest advance in the statement as respects loss reserve for the lines under consideration was the introduction of Schedule P, Parts 5 and 5A. While it may be argued that these schedules are of value from a retrospective viewpoint, nevertheless they have a distinct current value in that they give fair warning that the transgressor eventually, and within a reasonably short period, will be brought to bar. The proposals of the Committee incorporate these "run-off" tests in an improved form. For the Compensation line in particular, where in general the rate of liquidation of claims by an individual company with a reasonable volume of business follows a definite pattern, a reasonable indication is afforded for testing the adequacy of the loss reserve for the latest policy year. The incorporation of the lines in Schedule "O" is additional substantiating data for the adequacy of the aggregate reserve for all policy years.

It is the writer's firm belief that the adoption of the Committee's recommendations would in no way detract from the value of the annual statement from the standpoint of solvency standards.

## REPORT OF COMMITTEE ON COMPENSATION AND LIABILITY LOSS AND LOSS EXPENSE RESERVES

### COMMITTEE'S REVIEW OF DISCUSSIONS

The Committee is indebted to the members of the Society who submitted discussions of the report. In addition to the foregoing discussions, members of the Committee have received a considerable number of informal comments. As a result of its consideration of the points raised, the Committee finds no impelling reason for making any change in the original recommendations.

As to the question of companies which have recently commenced writing the lines under consideration, the Committee recognizes the existence of the problem of possible overextension. As regards compensation, the problem simply is not being met by the present Schedule P method because of the lag in the recording of audited premiums. As regards liability, the present Schedule P method may, in some cases, provide a safeguard, which safeguard, however, may be absent when most needed. In any event, the Committee feels that this problem of overextension should not be met through arbitrary loss reserve standards.

Assuming that there is substantial agreement in principle with the Committee's recommendations, the question naturally arises as to whether anything constructive can be accomplished prior to necessary statutory changes. The following specific changes in the annual statement blank could be made as of the end of this year without any changes in the Statutes:

1. The inclusion of separate lines for compensation, automobile liability, and liability other than automobile in the bloc at the top of the present page 5 of the annual statement.
2. The inclusion of separate items for compensation, automobile liability, and liability other than automobile in the section for loss expense on page 5.
3. The inclusion of the statutory excess, divided as between compensation and liability, as a separate liability item on page 5.
4. The inclusion of a provision for the increase or decrease in the above statutory excess in the miscellaneous portion of the Underwriting and Investment Exhibit. Thus, changes in the statutory excess would not affect underwriting results.
5. The inclusion of compensation, automobile liability, and liability other than automobile in Schedule O.
6. The subdivision of Column 12 in Schedule P, Part 1, to provide separate loss and loss expense reserves; a similar subdivision of Column 11 in Schedule P, Part 2.
7. The subdivision of Schedule P, Part 5, to provide separate exhibits for automobile liability and liability other than automobile.

8. The provision in Parts 5 and 5a of two additional columns to show the paid and outstanding losses for the latest valuation date.

Inasmuch as the annual statement blank will probably undergo considerable change before the end of 1949, this is a particularly appropriate time to consider the above revisions. As has already been noted, these revisions would not require action by other than the Blanks Committee of the National Association of Insurance Commissioners.

## REVIEWS OF PUBLICATIONS

CLARENCE A. KULP, BOOK REVIEW EDITOR

*Adequacy of Workmen's Compensation.* Arthur H. Reede. Harvard University Press, Cambridge, 1947. Pp. 422.

Although published in 1947, the Preface of this book indicates that:

The writer was invited in 1937 by the Harvard University Committee on Research in the Social Sciences to make a study of industrial accident insurance in the United States. The field work on this project was done between September 1, 1937, and September 15, 1939. The study has assumed approximately its present form when in 1943 the writer was ordered overseas to serve in the Army of the United States. Since his return to the United States in November 1945, he has made necessary revisions in the text including the addition of a supplement on recent developments.

While the supplement does briefly contribute more recent data, nevertheless the basic study must be considered descriptive of conditions existing around 1940, or prior to World War II. This fact alone should not cause one to dismiss the book as out-dated. An unavoidable defect in a study of this nature is inherent in the essential dynamics of our society. Conditions change, laws are amended, inflationary and deflationary effects are felt and much of the factual data incorporated in a study becomes obsolescent.

Fortunately some of the findings in the study are by no means as inapplicable to the current situation as one might assume from the chronology and time charts contained in the study. If Dr. Reede has shown that compensation benefits were inadequate in 1940, it is apparent that they are more inadequate when judged by current standards. It is true that New York and a few other states have liberalized benefits, but since living costs have risen, the increased benefits in most cases have not changed sufficiently to invalidate Dr. Reede's findings or conclusions.

A close reading of the book will make many unhappy. The study, both directly and through inference, calls attention to the many inadequacies in the existing system. In 1940 nearly 25 years of experience with workmen's compensation insurance was available. The study discloses gaps in coverage, inadequate benefit scales, an unscientific and apparently haphazard approach toward legislative changes. The study too indicates that little has been done to assure a more orderly development in the future.

The five main parts to the book are as follows:

- I The Expanding Scope of Workmen's Compensation Insurance 1915-1940
- II The Benefit Scale 1915-1940
- III The Proportion of Wage Loss Compensated
- IV The Cost of Workmen's Compensation Insurance 1915-1940
- V Injury Prevention and Compensation Costs

Each of these contains an introductory note, a number of chapters dealing with related phases, and a summary. The summaries are extremely valuable. In concise form they draw inferences, make conclusions or often simply state the unsolved problem.

Some of the findings present both the good and bad features of the system each state has established through legislation. It is significant that it has taken some states more than 25 years to enact a compensation act. It is also of significance that an industrial state such as New York, operating usually under the most liberal law, can continue to liberalize benefits and retain its pre-eminent position as an industrial state. Obviously the insurance cost burden, although considered heavy by some, is not a deterrent to industrial progress. Mississippi without a law has certainly reaped no competitive advantage in its industrial development.

From a purely personal viewpoint I was pleased to read Part III, *The Proportion of Wage Loss Compensated*. I have always felt that this is one of the best methods, if not the best method, for determining the relative adequacy of benefit scales. The whole part, particularly Chapter X, entitled *Computing the Theoretical Proportion of Wage Loss Compensated* is clearly and ably presented.

There is detailed demonstration of the fact that in North Carolina only about 26.4 per cent of wage loss is compensated. It is a distinct disappointment not to find a table showing comparative figures for all the other states. The rather inadequate *Table of Comparative Benefits* of the National Council on Compensation Insurance is included. A table for all states developed along the lines used for North Carolina would have added much to the comprehensiveness of the analyses and would have rounded out this part of the study.

I find Dr. Reede's chapter on medical benefits inadequate. Approximately 33 $\frac{1}{3}$  per cent of the total benefit cost is utilized for medical treatment, as compared to about 2 per cent for permanent total disability. Nevertheless more time has been devoted to permanent total disability, and the chapter on permanent total disability is about twice as long as the one on medical benefits. Data are lacking on the number of medical cases treated, on the cost of compensable and non-compensable cases, on fee schedules and their underlying bases, on the distribution of the cost between hospital and medical, on the relative cost and duration of treatment in "free choice of physician" states as compared with other states and on many other phases. Admittedly much data are difficult to obtain and perhaps unobtainable. Nevertheless the data compiled by the National Council on Compensation Insurance in its Medical Cost Study and similar analyses could have been used and would have been a valuable inclusion.

The special studies and discussions devoted to Massachusetts experience are of particular interest. Obviously it would be an onerous and perhaps fruitless task to perform the same analyses for other states. It should be

pointed out that such data are available, and such studies can be made for other states, if those interested in the subject will devote the time and effort required to compile the pertinent facts. Unfortunately such studies cannot be conducted without cost.

It is evident that employers, labor, legislative committees and others interested in the relationship of rates to benefits need never be as uniformed as they have been in the past. The book newly makes available comparative data, basic material and an intelligent presentation of the problems and methods of solution tried in the various states.

Dr. Reede has made an outstanding contribution to the literature in the field of workmen's compensation and his findings should provide a basis for intelligent improvements in the future.

It is a fine book on a difficult subject and should prove of great value to all interested in workmen's compensation.

J. J. SMICK

*Adjustment of Insurance Loss Claims on Merchandise—Accounting Problems and Procedures.* Leo Rosenblum. King's Crown Press, Columbia University, N. Y., 1948. Pp. xi, 194.

Dr. Rosenblum has written a very comprehensive book on the adjustment of claims for losses under burglary, merchandise and property fire insurance policies. The accounting data required in connection with the application or proposal for selected forms of insurance and in the submission of claims for losses, and the procedures followed by insurance company accountants in the review of the statements supporting the claim, are reviewed.

Separate chapters are devoted to the accountant's work in connection with declarations, maintaining records, accounts and inventories; to methods of proof and evaluation of claims; to moral hazard and motives for fraudulent or exaggerated claims; to the review and check of records; to litigation including the role of the accountant. There is an appendix consisting of a fraudulent invoice, books and records which survived a fire, an inflated inventory, an arsonist's settlement sheet, and the questionnaire form of The New York Board of Fire Underwriters. The book also contains a bibliography, table of cases and index.

Dr. Rosenblum's book indicates a great deal of study and research. It refers to many court decisions and authorities in support of, or illustrating the various subjects, which he has treated.

The book should be interesting and instructive both to those responsible for claims and those studying property insurance in general.

CHARLES E. WOODMAN

## PUBLICATIONS RECEIVED:

1. *The Insurance Broker Agent*. Harrison Law. Published by same, Nutley, 1948. Pamphlet, Pp. 128.
2. *The Manufacturer and Insurance*, 3rd edition. Laurence S. Myers. National Underwriters, Cincinnati, 1948. Pp. xvii, 250.
3. *Motor Insurance*, 2nd edition. A. G. M. Batten and W. A. Dinsdale. Stone and Cox, London, 1947. Pp. xiii, 325.
4. *Third Party Insurance*, 2nd edition. A. G. M. Batten and W. A. Dinsdale. Stone and Cox, London, 1947. Pp. x, 265.
5. *Law's Statistical Tables, 1949*. Harrison Law. Published by same, Nutley, N. J., 1949. Pamphlet. Unpaged.
6. *Principles and Practice of Accident Insurance, Part III*. W. A. Dinsdale. Buckley Press, London, 1948. Pp. 86.



## STATISTICAL NOTES

The statistical note appearing in Volume XXXIV, page 95 entitled "Accident Rates with Confidence Limits", in which Eli A. Grossman appears as the author, should be corrected to show that the authors were Eli A. Grossman and Bernard Friedman, Professor of Mathematics, New York University, the latter not being a member of the Society.

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**OBITUARY****HARILAUS E. ECONOMIDY**

1883-1948

Mr. Economidy was born on May 29, 1883 at Mylassa, Greece and died on April 13, 1948 at Galveston, Texas.

He was educated at Smyrna, Turkey, in English and American schools. Two years of preparatory studies in civil engineering at London, England followed. He came to the United States in 1905 where he was connected with the publishing business for nine years. He became a naturalized American citizen in 1910. He was admitted as an Associate of the Society in 1923.

Mr. Economidy entered the employ of the American Indemnity Company of Galveston, Texas as chief statistician in 1914. During succeeding years, he was elected Treasurer-Comptroller and also a member of the Board and of the Executive Committee, remaining with this Company until 1931. He was elected a member of the Board of three insurance companies affiliated with his employer.

In the following three years, he became senior examiner for the Board of Insurance Commissioners of Texas. He spent two years with a casualty reciprocal and then returned (1937-1939) as one of the chief examiners of the Texas Insurance Department for Convention examinations.

Thereafter, he became Vice-President-Comptroller of the United Employers Casualty Company for a few years. He then practiced as an independent accountant and actuary until his death.

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**OBITUARY**

HAROLD R. GORDON

1895-1948

Harold R. Gordon, Managing Director of the Health and Accident Underwriters Conference, died suddenly on July 8, 1948 in his office in Chicago prior to leaving for home. Death was attributed to a cerebral hemorrhage. He is survived by his widow, a daughter and son.

He was born on May 26, 1895 in Dearborn, Michigan and attended high school in Detroit. He graduated from Michigan State Normal College with the degree of Bachelor of Pedagogy in 1915 and taught mathematics for two years in the Detroit schools. At the beginning of World War I he enlisted in the Army, and was commissioned in the air service as a pilot. Following his discharge in 1918 he was employed by the city of Detroit as a playground supervisor for six months and later entered Columbia University in New York City. Mr. Gordon then went to work for the Lincoln Motor Car Company of Detroit, following which he assumed his work with the Health and Accident Underwriters Conference.

Mr. Gordon was a nationally known leader in the accident and health insurance field and had been associated with the Conference for 27 years. He started with the organization in Detroit as a statistician and when the offices of the Conference were moved to Chicago in 1921 he was appointed the first executive secretary. When the association expanded its activities four years ago he was made Managing Director.

He became an Associate of the Casualty Actuarial Society on November 19, 1929 and attended many meetings of the Society.

Mr. Gordon was one of the leading figures in the accident and health insurance field and had seen it grow from a minor premium income producer to an industry producing nearly a billion dollars a year in premiums. A frequent speaker before meetings both in and out of the industry, his views were looked to with respect. His counsel and advice were eagerly sought by leading executives in the industry and he was never too busy to give freely of his time toward help and solution of any problem. Kind, affable, conscientious, persevering, forthright, and extremely capable, his presence will be sorely missed by a legion of friends throughout insurance circles.

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**OBITUARY****CHARLES HUGHES**

1874-1948

Charles Hughes died at his home in Freeport, New York, on Aug. 27, 1948.

Mr. Hughes was born July 2, 1874 in London, England, and was educated at St. Mark's College and the United Westminster School.

He decided to go to Canada and entered the service of the Sun Life Assurance Company at its Montreal Head Office in 1892 where he remained for about 8 years. From 1900 to 1903 he held a position in the actuarial department of the Equitable Life Assurance Society of the United States and in 1902 he became an Associate of the Actuarial Society of America.

Following short periods of service as actuary of the Connecticut Insurance Department and as managing director and actuary of the Crown Life in Toronto until 1907, he was appointed Chief of the Casualty Bureau in the New York Insurance Department. In 1911, he left this position to become manager of the newly organized Workmen's Compensation and Information Bureau in New York and subsequently served as assistant manager of the United States Branch of an alien reinsurance company.

In 1914, Mr. Hughes re-entered the New York Insurance Department as Chief of the Audit Bureau and he continued in this position until July 31, 1944 when he retired from service.

Mr. Hughes was a Fellow of the American Institute of Actuaries and a Fellow of the Casualty Actuarial Society. His experience in the insurance field was varied and extensive. During his long connection with the New York Department he served continuously and with distinction on the Committee for Valuation of Securities of the National Association of Insurance Commissioners. He was also a member of the Committee to Study the need for a new Mortality Table and of the Committee to study Non-forfeiture Benefits.

Mr. Hughes was of a sociable nature and had many acquaintances. He was highly regarded by his associates for his ability and judgment.

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**OBITUARY****ROBERT SEDGWICK HULL**

1884-1947

Robert Sedgwick Hull, a member of the Society since 1921 and a Fellow since 1929, died suddenly near Buffalo, New York, on November 30, 1947.

He was born in Bath, New York, January 29, 1884. Upon graduating from High School he joined the Connecticut Mutual Life Insurance Company where he remained nine years. Subsequently, he entered public utility and general accounting work and in 1918 returned to insurance work in the Casualty Actuarial Department of the Travelers Insurance Company. He joined the Standard Accident Insurance Company in 1927 as Comptroller and subsequently had further insurance experience of a diversified nature. At the time of his death he held the position of Administrative Analyst of the Social Security Administration at Washington.

Mr. Hull's talents were especially noteworthy in the field of insurance accounting and he was the author of "Casualty Insurance Accounting" published by The Ronald Press Company under the auspices of this Society in 1930. He also contributed several papers to the Proceedings.

He maintained a keen interest in the Society and rarely missed attendance at its meetings.

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**OBITUARY****GREGORY COOK KELLY****1879-1948**

Gregory Cook Kelly, a fellow of the Society since 1938, died at his home, Frome Farm, Chester County, Pennsylvania, on September 11, 1948. He was born in Elmira, New York, on August 27, 1879. When he was eleven, the family moved to Philadelphia, where he attended Germantown Academy, the Lawrenceville School in New Jersey and, later, the University of Pennsylvania. He was graduated from the University in 1901, with a degree in Mechanical Engineering, and spent two years with the Pencoyd Iron Works, in the Engineering Department. During the next few years he was engaged in business with his father, a pioneer in coal development work.

His insurance career started when he became associated with the Engineering Department of the Philadelphia Office of the Hartford Accident and Indemnity Company, where he remained until January of 1917, when he was employed by the Pennsylvania Compensation Rating and Inspection Bureau, which had then been in existence for a little more than a year. His appointment as General Manager of the Bureau became effective April 1, 1917, and he continued in that position until his death.

Gregory Kelly was one of the pioneers in compensation rate-making in this country, and in the early days of the Pennsylvania Bureau collaborated with the late Dr. E. H. Downey in the development of sound classification and rating methods. He had an unusual grasp of the many complex problems which faced the business, and his clear thinking and wide experience contributed materially to their solution. He was widely known in insurance circles, particularly in Pennsylvania, and was highly respected by all who knew him. His passing leaves a void which can never be completely filled, and he will long be remembered by his many friends and business associates.

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**OBITUARY**

WILLIAM L. MOONEY

1874-1948

William L. Mooney, Vice-President of the Aetna Casualty and Surety Company for fourteen years until he retired in 1937, died October 21, 1948 at his home in West Hartford, Connecticut.

Mr. Mooney was born in Jersey City and was educated in the New York City schools. In his long insurance career he served the Union Casualty Company as general agent 1902-1903, the Philadelphia Casualty Company as assistant agency manager 1903-1907, and the Aetna Casualty and Surety Company as Agency Supervisor 1907-1919, Agency Secretary 1919-1923 and Vice-President 1923-1937.

Mr. Mooney was interested primarily in the administrative side of insurance. During his active association with the Aetna the casualty business increased tenfold and the field organization, largely his creation, was extended greatly. While he took little active part in the Casualty Actuarial Society, to which he was elected a fellow in 1926, he held in high regard the work of the actuary.

After retiring, Mr. Mooney devoted himself to civic problems and rendered valuable service to the community and state in various capacities concerning social welfare.

Mr. Mooney was a man of strong positive convictions which he stated freely in his genial manner without giving offense. He was one of the best known of all Aetna officials and was regarded with affection and respect by all with whom he was associated.

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**OBITUARY**

WILLIAM RICHARD STRONG

1866-1946

William Richard Strong was born on August 23, 1866 at London, England and died at his home in Kew, Melbourne, Australia on January 10, 1946.

Mr. Strong became a Fellow of the Institute of Actuaries of Great Britain in 1902 and a Fellow of the Casualty Actuarial Society in 1915. He had spent thirty years in the service of the London Guarantee and Accident Company, Limited at its Head Office in London, England. At the time of his retirement on June 30, 1916 he held the position of Secretary and Chief Executive Officer.

After the conclusion of the First World War of 1914-1918, Mr. Strong went to Australia to become connected with the British Australian Wool Realization Association, of which he was Secretary during the last years of its liquidation. Later, he undertook actuarial work for a firm of stock and share brokers in Melbourne, from which he retired only the month prior to his death.

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## ABSTRACT FROM THE MINUTES OF THE MEETING

MAY 14, 1948

The semi-annual meeting of the Casualty Actuarial Society was held at the Carmel Country Club, Carmel, New York, on Friday, May 14, 1948.

President Cahill called the meeting to order at 10:30 A.M., the roll was called showing the following thirty-one Fellows and six Associates present:

## FELLOWS

ALLEN, E. S.	GODDARD	PRUITT
BARBER	JOHNSON	ROSS
BARTER	KORMES	ROWELL
BERKELEY	LANGE	SMICK
CAHILL	LINDER	SMITH, S. E.
CARLETON	MASTERSON	UHTHOFF
CARLSON	MATTHEWS	VALERIUS
COGSWELL	MAYCRINK	VAN TUYL
CROUSE	MILLS	WIEDER
ELLIOTT	OBERHAUS	WILLIAMS
	PERRYMAN	

## ASSOCIATES

BLACK, N. C.	LUFKIN	SCAMMON
CROSSMAN	MUNTERICH	WOLFRUM

By invitation, a number of officials of Casualty Insurance Companies and other organizations were present.

The minutes of the meeting held November 14, 1947 were approved as printed in the *Proceedings*.

No formal papers were presented at this meeting of the Society. An informal dinner was held at the Club on the evening of May 13, 1948.

Informal discussion of the following topics was participated in by the members of the Society and by representatives of insurance organizations: President Cahill turned the meeting over to Vice-President Goddard for a discussion on "State Sponsored Cash-Sickness Plans." Vice-President Barber then presided over a discussion on "Should there be standardized experience rating procedures for casualty insurance?"

Upon motion, the meeting adjourned at 1:30 P.M.

## ABSTRACT FROM THE MINUTES OF THE MEETING

NOVEMBER 19, 1948

The annual meeting of the Casualty Actuarial Society was held at the Hotel Biltmore, New York, on Friday, November 19, 1948. An informal dinner had been held on Thursday evening, November 18th at the Hotel Biltmore; the dinner group was addressed by Winfield W. Greene, former president of the Society and by Frank W. Lovejoy, sales executive of the Socony-Vacuum Oil Co.

President Cahill called the annual meeting to order at 10:20 A.M., the roll was called, showing the following 48 Fellows and 26 Associates present:

## FELLOWS

ALLEN	ELLIOTT	MCCONNELL
AULT	ELSTON	MILLS
BAILEY	EPPINK	OBERHAUS
BARBER	FARLEY	PERRYMAN
BARTER	FONDILLER	RODERMUND
BERKELEY	GARDINER	ROSS
BLANCHARD	GINSBURGH	SALZMANN
BROWN, F. S.	GODDARD	SCHLOSS
CAHILL	GRAHAM, C. M.	SMICK
CARLETON	JOHNSON	SMITH, S. E.
CARLSON	KOLE	TARBELL
COGSWELL	KORMES	VALERIUS
COMSTOCK	KULP	VAN TUYL
CROUSE	LINDER	WIEDER
DAVIES	MARSHALL	WILLIAMS
DORWEILER	MASTERTON	WILLIAMSON
	MAYCRINK	

## ASSOCIATES

BLACK, N. C.	HEWITT	RESOY
BUGBEE	LIVINGSTON	SAWYER
CLARKE	LUFKIN	SCAMMON
DOWLING	MACKEEN	STOKE
GILDEA	MONTGOMERY	UHL
GROSSMAN	MUNTERICH	VERGANO
HARRIS	PENNOCK	WARREN, C. S.
HART	POTOFSKY	WOLFRUM

By invitation, a number of officials of casualty insurance companies and insurance organizations were present.

Mr. Cahill read his Presidential Address.

The minutes of the meeting held May 14, 1948 were approved as printed in the *Proceedings*.

The Secretary-Treasurer (Richard Fondiller) read the report of the Council and upon motion it was adopted by the Society. James B. Gardiner, Harold W. Schloss and Paul A. Turner had passed the examinations and had been admitted as Fellows: a diploma was presented to each by the President. Charles C. Hewitt, Jr., Gilbert R. Livingston, John A. Resony and Aubrey White had passed the examinations and had been admitted as Associates. The annual dues of Fellows had been increased to \$20 and those of Associates for the first five years had been increased to \$10 and thereafter \$20.

Upon recommendations of the Council, Arthur L. Bailey was elected a Fellow by the Society under the terms of Article III of the Constitution.

The President announced the deaths, during the last year, of five Fellows, Charles Hughes, Robert S. Hull, Gregory C. Kelly, William L. Mooney, William R. Strong, and two Associates, Harilaus E. Economidy and Harold R. Gordon. Obituary notices appear in this Number of the *Proceedings*.

The Auditing Committee (Howard G. Crane, Chairman) reported that the books of the Secretary-Treasurer had been audited and his accounts verified.

The report of the Secretary-Treasurer was read and accepted. The report on finances follows:

### CASUALTY ACTUARIAL SOCIETY ANNUAL REPORT ON FINANCES

Cash Receipts and Disbursements from Oct. 1, 1947 to Sept. 30, 1948

Income		Disbursements	
On deposit in Marine Midland on October 1, 1947	\$2,780.98	Printing & Stationery	\$4,668.41
		Postage, Tel., Express, Etc.	268.31
		Secretarial Work	443.75
Members Dues	\$2,389.00	Examination Expenses	769.51
Sales of Proceedings	748.42	Luncheon & Dinners	481.90
Examination Fees	694.73	Library Fund	42.11
Luncheons & Dinners	322.00	Storage of Proceedings	63.00
Michelbacher Fund	658.80	Miscellaneous	<u>163.93</u>
Reprints	15.00		
Foreign Exchange	- 4.43		
	<u>4,823.52</u>	Total	\$6,900.92
		On deposit Sept. 30, 1948 in Marine Midland Trust Co.	<u>703.58</u>
Total	<u>\$7,604.50</u>	Total	<u>\$7,604.50</u>

Assets		Liabilities	
Cash in Bank	\$ 703.58	Unpaid Stationery Bills:	\$ 89.99
Bonds Owned	3,750.00*	Michelbacher Fund	3,008.61
		Fondiller Prize	100.00
		Total Liabilities	\$3,198.60
		Surplus	1,254.98
Total Assets	<u>\$4,453.58</u>	Total Liabilities & Surplus	<u>\$4,453.58</u>

\*Present Redemption Value is \$4,860.00

The Examination Committee (Seymour E. Smith, General Chairman) submitted a report of which the following is a summary:

### 1948 EXAMINATIONS – SUCCESSFUL CANDIDATES

The following is a list of those who passed the examinations held by the Society on May 11 and 12, 1948:

#### ASSOCIATESHIP EXAMINATIONS

PART I:	F. J. BUSH	S. FEIT	I. LEPKIN	
	J. P. CHIARULLI	D. P. FRAME	R. A. NIX	
	(Sec. 2)*			
	G. C. S. CLARKE	R. E. GALLOWAY	R. B. PENNYCOOK	
	A. L. CRAWFORD	A. J. GREENWOOD	J. A. RESONY	
	D. CRITCHLEY	F. HARWAYNE	L. F. S. RITCEY	
		(Sec. 2)*		
	F. DEBARTOLO	W. J. HUDSON	I. ROSENBERG	
	A. DELANEY	C. N. KAPLAN	W. J. SAUNDERS	
	R. D. DRISKO	R. E. LARSON	R. G. SWAIL	
	G. V. ETHERINGTON		D. G. WELLAND	
	PART II:	J. A. BOYJIAN	D. P. FRAME	G. R. LIVINGSTON
				(Sec. 3)*
J. P. CHIARULLI		G. E. GOULD	W. J. PERKINS	
(Sec. 4)*				
F. DEBARTOLO		J. A. GREENWOOD	G. S. RAMSAY	
R. DELANEY		J. HARACK	J. A. RESONY	
W. S. DEWAR		H. F. LACROIX, JR.	J. S. RIPANDELLI	
		(Sec. 4)*	(Sec. 4)*	
R. D. DRISKO		GRACE LEIGHT	L. F. S. RITCEY	
A. V. FAIRBANKS		F. G. LETWIN	J. W. THOMAS	
S. FEIT			A. E. WHITON	

PART III:	R. E. BRUCE	D. P. FRAME	S. L. OLDS
	W. R. BURNS	J. A. GREENWOOD	W. J. PERKINS
	F. J. BUSH	M. B. HARDIN	J. A. RESONY
	A. L. CRAWFORD	H. LACROIX, JR.	J. S. RIPANDELLI
	D. CRITCHLEY	H. L. MCCOLLUM	L. F. S. RITCEY
	A. DELANEY	F. E. NEMMERS	M. L. ZEFFERT

PART IV:	R. H. BENT	F. J. HOPE	H. W. SCHLOSS
	C. C. HEWITT, JR.	J. A. RESONY	A. WHITE

\*Other section of this Part credited to veterans by the Council under Rule 4(e).

FELLOWSHIP EXAMINATIONS

PART I:	NATHAN F. JONES	G. MUNTERICH	ELIA VERGANO
	W. LESLIE, JR.		R. J. WOLFRUM

PART II:	J. B. GARDINER	G. MUNTERICH	R. J. WOLFRUM
		PAUL A. TURNER	

PART III:	J. B. GARDINER		PAUL A. TURNER
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PART IV:	J. B. GARDINER		PAUL A. TURNER
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The Council's re-election of Emma C. Maycrink as Editor was announced. T. O. Carlson indicated his unwillingness to serve further as Librarian and expressed the thought that the Librarian's duties and prerogatives might well be passed on to one of the younger members of the Society. It was accordingly decided to defer the election of a Librarian to the next meeting of the Society.

The annual elections were then held and the following officers and members of the Council were elected:

President . . . . .	James M. Cahill
Vice-President . . . . .	Harmon T. Barber
Vice-President . . . . .	Russel P. Goddard
Secretary-Treasurer . . . . .	Richard Fondiller
Editor . . . . .	Emma C. Maycrink

Members of Council:

Seymour E. Smith, Joseph Linder, Charles M. Graham (terms expire in 1951)

The papers appearing in this Number were presented.

A Special Committee (Joseph Linder, Chairman) submitted a report on "Compensation and Liability Loss and Loss Expense Reserves". The Society took no action on the report, which was discussed and ordered to be printed in this number of the *Proceedings*.

Recess was taken for lunch at the Hotel until 2:15 P.M.

Informal discussion of the following topic was participated in by the members of the Society and by representatives of insurance organizations:

Current questions relating to automobile liability insurance such as private passenger classification plans, trends of experience and rating problems and medical payments coverage and single limit policy.

Upon motion, the meeting adjourned at 4:30 P.M.

# CASUALTY ACTUARIAL SOCIETY

## EXAMINATION COMMITTEE

ERNEST T. BERKELEY - - - - - General Chairman

IN CHARGE OF  
ASSOCIATESHIP EXAMINATIONS

EDWARD S. ALLEN, Chairman  
JOHN W. WIEDER, JR.  
STEFAN PETERS

IN CHARGE OF  
FELLOWSHIP EXAMINATIONS

ROGER A. JOHNSON, JR., Chairman  
SAMUEL M. ROSS  
CHARLES W. CROUSE

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## EXAMINATION FOR ENROLLMENT AS ASSOCIATE

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### PART I

1. (a) A casualty insurance company determines for experience purposes the manual premium for a given classification by multiplying the exposure,  $E$ , (an integer number) by the manual rate,  $p$ , per unit of exposure.  $p$  is given to dollars and cents and the manual premium,  $m$ , is obtained by rounding the exact product,  $E \cdot p$ , to the nearest dollar. The difference,  $m - E \cdot p = e$ , is the rounding error and is equal to a positive or negative number of cents or zero.

If the rounding error is considered a random variable and if in a large sample of  $100N$  manual premiums ( $N$  a positive integer) all possible random errors are assumed to occur with exactly equal frequency, determine:

- (i) the range of possible random errors,
  - (ii) the mean,  $M$ , of the  $100N$  random errors.
- (b) Name and define four commonly recognized measures of dispersion of a group of measurements.
2. For the following frequency distribution compute the second and third moments about the mean,  $M_x$ , expressed in given units and from these moments determine  $\sigma_x^2$  and  $a_3$ . Do not evaluate square roots.

$x$	$f(x)$
30	1
35	2
40	4
45	8
50	3
55	2

3. Determine  $r_{xy}$  and the equation of the line of regression of  $y$  on  $x$  for the following data:

$x$	$y$
0	-2
2	0
1	-1
3	3
4	4

4. (a) Given a normal frequency distribution of a variate,  $X$ , in which  $N = 1000$ ,  $v = 2$ ,  $M_x = 16$  and  $C_x = 4$ , how many variates fall between  $X = 12$  and  $X = 20$ , given  $A \phi \Big|_0^1 = .3413$ ?
- (b) Explain the meaning of the "time reversal test" and the "factor reversal test" as applied to price index numbers.
5. (a) The sum of \$1 in 2 years at a certain nominal rate of interest convertible half yearly, and of the present value of \$1 due 2 years hence at the same nominal rate of discount convertible half yearly is 2.00480032. Find the rate.
- (b) Given  $a \overline{36} \Big| = 25.999$  at 2%
- $S \overline{35} \Big| = 41.660$  at 1%
- Determine  $S \overline{70} \Big| =$  at 3.02% to one decimal place.

6. (a) Prove that:

$$\frac{S \overline{m} \Big|}{S \overline{m+n} \Big|} = 1 - \frac{a \overline{n} \Big|}{a \overline{m+n} \Big|} .$$

- (b) Given a value for  $a \overline{10} \Big|$  and a value for  $a \overline{30} \Big|$  at interest rate  $i$ , derive a formula in terms of  $a \overline{10} \Big|$ ,  $a \overline{30} \Big|$  and  $i$  which will enable you to find a value for  $a \overline{40} \Big|$  without the use of tables.
7. (a) A father leaves  $D$  dollars to his two sons aged 8 and 10 years. From the accumulation of this amount at interest rate  $x$ , compounded annually, each son is to receive an annuity immediate for 10 years certain beginning when he is 21. If both receive the same annuity, express the annual payment,  $R$ , in terms of  $D$  and  $x$ .
- (b) A man borrows a sum,  $A$ , at  $x\%$  interest payable annually. He intends to pay the interest on the loan each year as it falls due and to build up



a sinking fund by equal annual installments to repay the principal in 20 years. He assumes that he will be able to earn interest at rate  $y$  compounded annually on the sinking fund during the first five years and at rate  $z$  compounded annually thereafter. What sum must he place in the sinking fund at the beginning of each year?

8. (a) Ten years ago a serial bond of \$10,000 was issued with an interest rate of 4% payable semi-annually to be redeemed with repayment of \$250 at each interest paying date. A party has agreed to purchase this bond so as to yield 5% payable semi-annually. What should he pay for the bond, given  $a \frac{2.5\%}{20} = 15.58916$ ?

- (b) What sum is required to buy a new machine for \$1,000 and to provide for perpetual replacement of it at the end of every 10 years, assuming that the machines always have a scrap value of \$200 and the replacements always cost \$1,000, if money is worth  $2\frac{1}{2}\%$ ?

Given:  $\frac{1}{a^{10}} = .11426$

## PART II

1. (a) Find the maximum point and the points of inflection of the curve

$$y = e^{-x^2}, \text{ and sketch the curve.}$$

- (b) Find the limit of  $\frac{1 - \cos x}{x^3}$  as  $x$  approaches zero.

2. (a)  $y'' = 6x$  at every point of a curve, and at the point  $(0, -2)$  the curve is tangent to the line whose equation is  $2x - 3y = 6$ . Find the equation of the curve.

(b) Evaluate:  $\int_0^\pi \int_0^x x \sin \theta \, d\theta \, dx$ .

3. Find the first four terms in the expansion of

$$\frac{\log(1+x)}{\cos x} \text{ by Maclaurin's Theorem.}$$

4. (a) If  $u = \frac{xy}{x+y}$ , show that

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = 0.$$

(b) Given  $t \operatorname{anh} x = 4/5$ , find:

- (i)  $s \operatorname{ech} x$                       (iii)  $s \operatorname{inh} x$                       (v)  $c \operatorname{sch} x$   
 (ii)  $c \operatorname{osh} x$                       (iv)  $c \operatorname{tnh} x$

5. (a) Express  $p(x) = x^4 - 3x^2 + 2x - 7$  and successive differences in factorial notation.

(b) Find the polynomial,  $f(x)$ , of lowest degree for which  $f(0) = -5$ ,  $f(1) = -6$ ,  $f(2) = -1$ ,  $f(3) = 16$ .

(c) Given values for  $u_1, u_2, u_3, u_4, u_6, u_7, u_8, u_9$ , show that  $u_5$  may be determined from the relation,  $u_5 = \frac{4}{5}(u_4 + u_6) - \frac{2}{5}(u_3 + u_7) + \frac{4}{35}(u_2 + u_8) - \frac{1}{70}(u_1 + u_9)$ .

6. For the polynomial determined in 5 (b), use Newton's divided difference formula to compute an approximate value to two decimal places of the real root which lies between 1.9 and 2.3, given:  $(1.9)^3 = 6.859$ ,  $(2.1)^3 = 9.261$ ,  $(2.2)^3 = 10.648$ ,  $(2.3)^3 = 12.167$ .

7. (a) If  $u_x = \frac{5x + 12}{x^2 + 5x + 6}$ , find  $\Delta u_x$  and  $\Delta^2 u_x$ .

(b) Apply Lagrange's formula inversely to find a root of the equation,  $u_x = 0$ , when  $u_{30} = -30$ ,  $u_{34} = -13$ ,  $u_{38} = 3$ ,  $u_{42} = 18$ . Evaluate the square root in the answer to one decimal place only.

8. (a) By finite integration, sum to  $n$  terms the series whose  $x$ th term is  $2^x (x^3 + x)$ .

(b) Find  $a_{42:43}$  given,

$$a_{30:45} = 13.133 \quad a_{40:50} = 12.450 \quad a_{45:40} = 12.880$$

$$a_{50:40} = 11.898 \quad a_{45:45} = 12.432$$

### PART III

1. (a) On a certain street, there are 24 houses numbered from 1 to 24, odd numbers on one side, even on the other. Three houses are vacant. Assuming that the houses are each equally likely to be vacant, find the chances,

- (i) that the three houses are next to each other,  
 (ii) that the three houses are all on the same side of the street.

- (b)  $A$ ,  $B$  and  $C$  throw in order, each using three dice. Prove that  $A$ 's chance of throwing 10 first is  $\left(\frac{8}{13}\right)^2$  and find  $C$ 's chance.
2. (a) It has been determined from previous trials that  $A$  can hit a target 4 times in 5 shots;  $B$ , 3 times in 4 shots; and  $C$ , 2 times in 3 shots. They fire a volley. What is the probability that at least two shots hit the target?
- (b) Given a quadratic equation  $ax^2 + bx + c$ , where  $a \neq b \neq c \neq 0$  and  $a$ ,  $b$  and  $c$  are positive integers each less than 10, find the chance that the roots of the equation are real, all integral values of the coefficients satisfying the above conditions being equally likely.
3. (a)  $A$  and  $B$  cast alternately with two dice. It is agreed that, on each failure to win, the prize money is to be reduced by 3% of its value at the previous attempt.  $A$  wins if he throws 6 before  $B$  throws 7, and  $B$  wins if he throws 7 before  $A$  throws 6.  $A$  starts first. Compare the values of the respective chances of  $A$  and  $B$ .
- (b) Of two purses, one originally contained 25 dimes, and the other 10 dimes and 15 pennies. One purse is taken at random and 4 coins drawn out, which prove to be all dimes. What is the chance that this purse contains only dimes, and what is the probable value of the next draw of one coin from this purse, if the four coins are not replaced?
4. A player tosses a coin and is to score one point for every head turned up and two for every tail. He is to play on until his score reaches or passes  $n$ . If  $p_n$  is his chance of attaining exactly  $n$ , show that  $p_n = \frac{1}{2}(p_{n-1} + p_{n-2})$  and find the value of  $p_n$ .
5. (a) Distinguish between,
- (i) an "ultimate" mortality table and a "select and ultimate" mortality table,
  - (ii) "curtate" expectation of life and "complete" expectation of life.
- (b) Express in commutation symbols the net level annual premium for the following policy issued at age  $x$ :
- \$1,000 death benefit first policy year  
 \$1,000 + 100( $t-1$ ) death benefit  $t_{th}$  policy year  
 $1 \leq t \leq 20$

\$3,000 pure endowment at end of 20<sup>th</sup> policy year  
 Premiums payable for 15 years.

6. (a) Prove  $\frac{A_x - A_y}{A_x - A_{10}} = \frac{a_x - a_y}{a_x - a_{10}}$

- (b) A certain endowment policy issued at age 40 provides for the payment of \$1,000 if the insured dies before age 65 or \$2,000 cash payment if the insured survives to age 65. The policy further provides, at death or at age 65, for the return, without interest, of all net premiums paid. The net annual premiums for the first 5 years are exactly  $\frac{1}{2}$  the ultimate net annual premiums payable thereafter. Show that the ultimate net annual premium may be expressed as follows:

$$\frac{2000 (M_{40} - M_{65} + 2D_{65})}{N_{40} + N_{45} - 2N_{65} - R_{40} - R_{45} + 2R_{65} - 5M_{45} + 50M_{65} - 45D_{65}}$$

7. Give a formula for the renewal net premium,  $B$ , for a whole life policy for the sum of \$1 issued at age  $x$  under a modified preliminary term method in which the first year net premium,  $a$ , is one-half of the net level annual premium for the same policy. Using the prospective reserve formula, find an expression for the  $t$ <sup>th</sup> terminal reserve.

8. (a) If  $P_{x:\overline{n}|}$  denotes the net level annual premium for an  $n$  year endowment policy for the sum of \$1 issued at age  $x$ , and if  ${}_tV_{x:\overline{n}|}$  denotes the  $t$ <sup>th</sup> terminal reserve for the same policy, show that,

$${}_tV_{x:\overline{n}|} = (P_{x+t:\overline{n-t}|} - P_{x:\overline{n}|}) a_{x+t:\overline{n-t}|}$$

- (b) Interpret in words the symbol,  $A_{xy}$ , and show that it is equal to  $va_{yx} - a_{xy}$ .

#### PART IV

- (a) Outline briefly the situation in the various states with respect to coverage and rates for occupational disease under the Standard Workmen's Compensation and Employers' Liability Policy.

(b) Name and describe three indirect loss coverages which may be offered in connection with Boiler and Machinery insurance.
- (a) Give an example of a person or corporation needing contractual liability coverage.

(b) In various casualty insurance manuals what is meant by an "a" rated classification? What is the purpose of such classifications?

3. (a) Under a Safe Burglary policy what distinguishes a burglary, which is covered, from a robbery, which is not covered?
  - (b) A contractor has applied to a surety company for a bid bond on a contract for which he desires to bid. What information do you think the surety company might require for proper underwriting of the bond?
4. (a) Describe the coverage provided under the automobile fleet plan and outline the method of obtaining the advance premium for a risk having 30 commercial automobiles and 4 trailers.
  - (b) Describe, and discuss the purpose of, deductible clauses in various casualty policies. What provision, frequently found in Accident and Health policies, serves a similar purpose?
5. (a) Explain the use of law amendment factors in Workmen's Compensation ratemaking. If, for a certain state, the percentage of weekly wage payable to an injured workman were increased from 50% to 55%, would you propose a corresponding increase of 10% in rates? Explain.
  - (b) Explain the difference between ratemaking by the loss ratio method and by the pure premium method.
6. (a) Rates for some casualty coverages vary by state and territory. Others vary by state and not by territory and others apply generally on a country-wide basis. Name a coverage in each of these three categories and give reasons for such differences.
  - (b) Name three sources of revenue for the payment of suretyship losses, in addition to premiums, that are usually available, and discuss their bearing on surety ratemaking.
7. Why is it necessary to temper formula methods with judgment in making rates for various casualty insurance lines? Discuss.
8. Discuss the adequacy for ratemaking purposes of experience reported on a policy year earned premium incurred loss basis as opposed to experience reported on a calendar year written premium paid loss basis with respect to:
  - (i) Workmen's Compensation
  - (ii) Manufacturers' and Contractors' Liability
  - (iii) Glass

**EXAMINATION FOR ADMISSION AS FELLOW****PART I**

1. (a) Name five ways in which risk may be reduced by business firms.  
(b) Distinguish between investment and speculation.
2. (a) Discuss the similarities and differences between insurance and hedging on the commodity exchanges.  
(b) In what legal and economic respects does wagering differ from insurance?
3. Compare the types of investments permitted life insurance companies with those permitted casualty insurance companies under the New York law. Why is a differentiation made?
4. (a) In what respects is retrospective rating a compromise between insurance and self-insurance?  
(b) In general, why is insurance preferable to self-insurance?
5. In each of the following cases, what rights does the employee have in consequence of his injury, and under what statutes or bodies of law do such rights exist?
  - a. A member of the crew of a vessel owned and operated by a New Jersey corporation, suffers a non-fatal injury caused by a defect in the vessel's equipment while the vessel is on the high seas.
  - b. An electrician employed by a shipbuilding contractor suffers an accidental injury arising out of and in the course of his employment while aboard a vessel under construction, launched in navigable waters at Baltimore, Maryland, but not yet commissioned.
  - c. While on duty aboard a merchant vessel owned and operated by a New York corporation, and while the vessel is moored at a pier along West Street in New York, a member of her crew suffers injury caused solely by the negligence of a fellow crew member.
6. (a) Under what two theories of law may a party who has suffered injury from the use of a product proceed against the manufacturer or vendor of the product?

- (b) What is the significance of the elimination of the words "caused by accident" from the insuring clause of a liability policy?
7. Discuss the reasons underlying the regulation of the business of insurance by a governmental body. Can regulation best be accomplished by separate state laws, by a federal law only, or by both state and federal laws?
8. Do you think that the course taken by the passage of the McCarran Act and by the adoption of the rate regulatory laws which were subsequently enacted by the several states, was the best course of action which could have been taken toward the attainment of those conditions under which the insurance business will best serve the public interest? Give the reasons for your answer.

## PART II

1. The experience period generally used in the Workmen's Compensation Experience Rating Plan is three years. Discuss the advantages and disadvantages of using a longer or shorter period.
2. The Workmen's Compensation Premium Discount Plan and Retrospective Rating Plans are generally applicable to risks producing \$1,000 or more in annual premium. For what risk sizes do you believe the Premium Discount Plan is preferable to the Retrospective Rating Plans? Give your reasons separately for Retrospective Rating Plans A, B and C.
3. Indicate the eligibility requirements for each of the following experience rating plans as applied in New York:
- Workmen's Compensation
  - Automobile
  - Garage Liability
  - Public Liability
  - Glass
  - Burglary
4. Do you think the insurance charge as used in the Workmen's Compensation Retrospective Rating Plans is correct for all risks regardless of the type of work performed or hazards involved? Discuss.
5. (a) Outline a method of estimating the cost of a plan for compulsory automobile compensation insurance.

- (b) Discuss the effect of the introduction of a compensation plan for automobile injuries with regard to:
- (i) The amounts collected by those injured.
  - (ii) The cost of insurance.
6. (a) Outline briefly the Wisconsin Plan of Prepaid Surgical, Obstetric and Hospital Insurance.
- (b) In what year, has it been estimated, will the system of Old Age and Survivors Insurance in this country mature, that is, when will it achieve a fairly constant relationship between aggregate contributions and aggregate benefit costs, and how was the estimate made?
7. (a) Compare the effect of interest on the actuarial reserve on the cost of public old-age insurance with its effect on the cost of annuities in a private insurance carrier.
- (b) What is the fundamental difference between the calculation of reserves for public old-age insurance and public unemployment insurance?
8. In the President's message to Congress in the early part of this year he recommended that three principal steps should be taken now with regard to the system of social insurance. Enumerate these steps and discuss their implications.

### PART III

1. In each of three consecutive calendar years,  $Y_1$ ,  $Y_2$  and  $Y_3$ , the total premiums earned by Company  $M$  for automobile bodily injury liability (a.b.i.l.) insurance, has been approximately the same. Throughout those three years, automobile accident frequencies have remained fairly constant, and the relative distribution of a.b.i.l. claims by size of ultimate settlement value has remained fairly stable. Within those three years, there has been no considerable change in  $M$ 's premium rates, or in  $M$ 's practice in claim investigation and adjustment, or in the distribution of  $M$ 's exposures by classification, by territory or by limits of liability. In the calendar year  $Y_3$ ,  $M$  settled and closed 10,000 a.b.i.l. claims of accident years  $Y_1$ ,  $Y_2$  and  $Y_3$ , including those finally closed without payment but excluding those subsequently reopened. The total amount paid in losses and allocated claim expenses on those 10,000 claims was \$2,000,000. At the end of  $Y_3$ , 5,000 a.b.i.l. claims of accident years  $Y_1$ ,  $Y_2$  and  $Y_3$  remain open in  $M$ 's register, and the sum of  $M$ 's case-basis estimates of the ultimate losses and allocated claim expenses on account of those 5,000 claims is \$1,100,000. What can you say about the adequacy or inadequacy of these estimates? Give the reason for your statement.



2. Does Part I of Schedule P more nearly accomplish its intended purpose than Part II? Give the reasons for your answer.
3. Company X writes a very large volume of workmen's compensation premiums, widely diversified as to industry, risk-size and jurisdiction. It has been suggested that, in the determination of its case-basis reserves, every compensation claim against the Company which is indeterminate after more than 26 weeks have elapsed since date of accident, should be valued in accordance with a single two-column table giving E, the expected total compensation loss per dollar of weekly compensation, as a function of T, the length of time from date of accident to date of valuation, such table to be constructed on the basis of the Company's total experience (of five to ten recent policy years) in the ultimate settlement of claims which were indeterminate. You have been asked by the managers of Company X to set forth briefly your comments concerning this suggestion. Write a draft of the memorandum you would address to them in response to their request.
4. (a) A certain casualty insurance company has available for each of its branch offices, varying in size from large to small, premiums written and losses incurred by line of business on a quarterly calendar year basis and wishes to approximate the premiums earned. Explain how this might be done and comment on the special factors, if any, that should be taken into account for:
- (i) Workmen's Compensation
  - (ii) Automobile
  - (iii) Liability Other Than Automobile
- (b) A casualty insurance company with its home office in the eastern section of the country and doing a national business has followed the practice of keeping its books open, as at the end of the year, until January 7 of the next year, in order to include loss transactions, from its offices all over the country, dated on or before the end of the year.
- The company decides to change this policy by closing its books on the last day of the year and including only those loss transactions in its home office on that date, in order to have the year's results available that much earlier.
- What effect does this have on the company's reserve for losses incurred but not reported, and what steps would you take to determine the extent to which the reserve should be modified?

- 5. (a) Design a single punch card to serve as both a premium and a loss card for the reporting of glass statistics to a ratemaking bureau from which the bureau can compile statistics showing the incurred losses on glass breakage that occurred in a given year with the premiums earned for the same year.
- (b) The premium card in the Personal Accident Statistical Plan provides separate fields for Principal Sum and term in months. How would you tabulate the punch cards in order to obtain the principal sum exposure for a policy year?
- 6. In view of the current trend toward compulsory "disability" insurance, outline a statistical plan by means of which a rating organization could collect data for testing the adequacy of rates or for making rates at some time in the future. Consideration should be given to the fact that many plans providing more than the minimum benefits are already in effect.
- 7. (a) Employ the moment generating function of a Poisson distribution to determine the variance of the distribution.
- (b) On the assumption that the frequency of accidents causing death or permanent total disability of one or more employees while engaged in operations of a certain class, is .300 per \$1,000,000 of payroll, write a formula for the determination of the probability that there will be more than four such accidents arising out of a group of operations of that class for which the total payroll will be \$10,000,000.
- 8. (a) Prove that if, for every pair of non-negative real numbers  $x$  and  $y$ ,  $x < y$ , the probability that the ratio,  $r$ , of actual losses to expected losses on a certain risk will exceed  $x$  but not exceed  $y$ , is  $\int_x^y f(r) dr$ , and if the mean value of  $r$  is 1, then the excess pure premium ratio for the risk corresponding to a specified value,  $s$ , of the ratio  $r$ , is:

$$1 - s + \int_0^s \int_0^s f(r) dr dr$$

- (b) For the purpose of determining discounts to be applied in the computation of premiums for burglary insurance of a certain form, the following hypothesis has been advanced:

If  $F_0$  be the expected frequency of losses on unprotected risks,  $F_w$  the expected frequency of losses on risks having protection of type W, etc., then

$$F_0 : F_w : F_x : F_y : F_z :: 100 : 80 : 60 : 40 : 20$$

On a selected sample of 5,000 risks, all of the same policy year, classification and territory and of approximately the same size, the experience has been as follows:

Type of Protection	Number of Risks	Number of Losses
None	1,000	52
W	1,000	46
X	1,000	21
Y	1,000	28
Z	1,000	3

Apply the  $X^2$  test to determine the compatibility of this experience with the hypothesis. Given that the critical value of  $X^2$  for 4 degrees of freedom is 11.67 at the .02 significance level, write a brief statement of the meaning of your result.

#### PART IV

1. A new casualty company proposes to begin business on October 1, 1949, with a Surplus as regards policy-holders of \$1,000,000 after all expenses of organization have been defrayed. Determine the maximum amount which it may expect to show in Surplus as regards policyholders in its Annual Statement (convention form) for the year ending December 31, 1949, if:
  - (i) its reserve for unearned premiums in that statement is to be determined upon the monthly pro rata basis; (ii) within that year, it writes nothing but non-retrospectively rated, single premium-payment, one-year term policies affording Bodily Injury Liability Insurance only; (iii) its Net Premiums Written (gross as to reinsurance) amount to \$24,000 on policies effective in October, 1949; \$48,000 on policies effective in November, 1949; \$72,000 on policies effective in December, 1949; (iv) it pays 5% of its Net Premiums Written for reinsurance against loss in excess of \$10,000 on account of any one accident, and receives no ceding commission for such reinsurance; (v) it pays 25% commission for all of its business; (vi) all of its business will be subject to a 2% premium tax and no other tax; (vii) all of its expenses within the period October 1 to December 31, 1949, other than loss expenses, commissions, taxes and reinsurance, amount to \$15,000; (viii) its interest, dividends and rents earned within the same period on investments amount to \$4,000; and (ix) within that period no accident occurs involving loss in excess of \$10,000 under any of its policies.

2. Do you think that the statutory requirements in respect to reserves for unearned premiums, commissions and taxes and in respect to the admission of assets, under which casualty companies now operate, should be modified or amended in any way? If so, how and why; and if not, why not?
3. State the purpose of and briefly describe Regulation No. 30 of the New York Insurance Department.
4. Describe the assets page of the Annual Statement Blank (convention form), pointing out how it differs from the usual accounting method of showing assets.
5. Outline a procedure for the determination of the interest which a carrier earns on workmen's compensation premiums as a percentage of the premiums written.
6. Describe a method of developing workmen's compensation rates on a primary-excess basis.
7. As of December 31, 1948, Company X (a primary insurer) has Admitted Assets of \$20,000,000 and Surplus as regards policyholders of \$6,000,000. Its managers estimate that in the Calendar Year 1949 its Net Premiums Written (before reinsurance) will amount to \$10,000,000, distributed approximately as follows: Workmen's Compensation \$3,500,000 of which \$500,000 will be for New York risks or risks under Workmen's Compensation laws providing approximately the same benefits as those provided by the New York law; Automobile Bodily Injury Liability \$3,000,000; Automobile Property Damage Liability \$1,500,000; Personal Injury Liability other than Automobile \$1,000,000 of which at least 10% will be for Products Liability; Property Damage Liability other than Automobile \$250,000; Burglary and Theft \$750,000. Outline the automatic covers which you would recommend to Company X as the covers which its agreements with its reinsurers ought to provide, and state briefly the reasons or principles upon which your recommendation would be based.
8. Company X (to which Question 7 refers) has never since its organization in 1928 written any Accident or Health Insurance. Its business has always been produced by brokers and independent agents, none of whom specializes in either of those lines, although many of them produce some accident and health business for other companies. The managers of the Company have asked for your opinion on the question of whether or not the Company should plan to enter the field of accident and health underwriting within the year 1949. Write a draft of the memorandum you would address to them in response to their request.

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# CASUALTY ACTUARIAL SOCIETY

ORGANIZED 1914

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1949 YEAR BOOK

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**Foreword**

**Officers, Council and Committees**

**List of Fellows and Associates**

**Officers of the Society since Organization**

**List of Deceased Members**

**Constitution and By-Laws**

**Examination Requirements**

(Addendum to Volume XXXV of the *Proceedings*)

*Corrected to March 1, 1949*

**No. 28**

## FOREWORD

The Casualty Actuarial Society was organized November 7, 1914 as the Casualty Actuarial and Statistical Society of America, with 97 charter members of the grade of Fellow. The present title was adopted on May 14, 1921. The object of the Society is the promotion of actuarial and statistical science as applied to the problems of casualty and social insurance by means of personal intercourse, the presentation and discussion of appropriate papers, the collection of a library and such other means as may be found desirable.

Prior to 1914, little technical study was given to the actuarial and underwriting problems of most of the branches of casualty insurance. The organization of the Society was brought about through the suggestion of Dr. I. M. Rubinow, who became the first president. The problems surrounding workmen's compensation were at that time the most urgent, and consequently many of the members played a leading part in the development of the scientific basis upon which workmen's compensation insurance now rests.

The members of the Society have also presented original papers to the *Proceedings* upon the scientific formulation of standards for the computation of both rates and reserves in accident and health insurance, liability, burglary, and the various automobile coverages. The presidential addresses constitute a valuable record of the current problems facing the casualty insurance business. Other papers in the *Proceedings* deal with acquisition costs, pension funds, legal decisions, investments, claims, reinsurance, accounting, statutory requirements, loss reserves, statistics, and the examination of casualty companies. The Committee on Remarriage Table submitted a report including tables, printed in *Proceedings* No. 40. The Special Committee on Bases of Exposure submitted a report which is printed in *Proceedings* No. 43. "The Recommendations for Study" appear in *Proceedings* No. 64 and are in effect for the 1948 examinations and thereafter. The Report of the Committee on Mortality for Disabled Lives together with commutation tables and life annuities has been printed in *Proceedings* No. 62. The Committee on Compensation and Liability Loss and Loss Expense Reserves submitted a report which appears in Volume XXXV.

The lower grade of membership in the Society is that of Associate. Examinations have been held every year since organization; they are held on the second Tuesday and following Wednesday during the month of May, in various cities in the United States and Canada. The membership of the Society consists of actuaries, statisticians, and executives who are connected with the principal casualty companies and organizations in the United States and Canada. The Society has a total membership of 277, consisting of 153 Fellows and 124 Associates. The annual meeting of the Society is held in New York in November.

The Society issues a publication entitled the *Proceedings* which contains original papers presented at the meetings. The *Proceedings* also contain discussions of papers, reviews of books and current notes. This Year Book is published annually and "Recommendations for Study" is a pamphlet which outlines the course of study to be followed in connection with the examinations for admission. These two booklets may be obtained free upon application to the Secretary-Treasurer, 90 John Street, New York 7, N. Y.



## CASUALTY ACTUARIAL SOCIETY

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NOVEMBER 19, 1948

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	CHARLES M. GRAHAM.....	1951
	JOSEPH LINDER.....	1951
	SEYMOUR E. SMITH.....	1951

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*\*Terms expire at the annual meeting in November 1949.*

*†Terms expire at the annual meeting in November of the year given.*

## COMMITTEES

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## MEMBERSHIP OF THE SOCIETY, NOVEMBER 19, 1948

## FELLOWS

Those marked (†) were Charter Members at date of organization, November 7, 1914.

Those marked (\*) have been admitted as Fellows upon examination by the Society.

Admitted	
*Nov. 21, 1930	AINLEY, JOHN W., Supervising Underwriter, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
*Nov. 14, 1947	ALLEN, EDWARD S., Actuary, Compensation Insurance Rating Board, 125 Park Avenue, New York 17, N. Y.
*Nov. 13, 1931	AULT, GILBERT E., Actuary, Church Pension Fund and Church Life Insurance Corporation, 20 Exchange Place, New York 5, N. Y.
Nov. 19, 1948	BAILEY, ARTHUR L., Actuary, New York Insurance Department, 61 Broadway, New York 6, N. Y.
May 23, 1924	BAILEY, WILLIAM B., (Retired), 52 West Hill Drive, West Hartford, Conn.
*Nov. 20, 1924	BARBER, HARMON T., Associate Actuary, Casualty Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
*Nov. 14, 1947	BARKER, LORING M., Actuary, Firemen's Fund Insurance Group, 401 California Street, San Francisco 20, Calif.
*Nov. 20, 1942	BART, ROBERT D., Office Manager, West Bend Aluminum Co., 92 Island Avenue, West Bend, Wis.
*Nov. 18, 1932	BARTER, JOHN L., Vice-President, Hartford Accident & Indemnity Co., 690 Asylum Avenue, Hartford 15, Conn.
*Nov. 13, 1931	BATHO, ELGIN R., Associate Actuary, Berkshire Life Insurance Co., 7 North Street, Pittsfield, Mass.
†	BENJAMIN, ROLAND, Treasurer, Fidelity & Deposit Company of Maryland and American Bonding Company, Baltimore 3, Md.
*Nov. 22, 1934	BERKELEY, ERNEST T., Actuary, Employers Liability Assurance Corporation, Ltd. and American Employers Insurance Company, 110 Milk Street, Boston 7, Mass.
†	BLACK, S. BRUCE, President, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.
Apr. 20, 1917	BLANCHARD, RALPH H., Professor of Insurance, School of Business, Columbia University, New York 27, N. Y.
†	BREIBY, WILLIAM, Vice-President, Pacific Mutual Life Insurance Company, 523 West 6th St., Los Angeles 14, Cal.
*Nov. 18, 1927	BROWN, F. STUART, Assistant to Vice-President, Bankers Indemnity Insurance Company, 15 Washington Street, Newark 2, N. J.
Oct. 22, 1915	BROWN, HERBERT D., (Retired), Glenora, Yates County, New York.

## FELLOWS

Admitted	
†	BUCK, GEORGE B., Consulting Actuary, 150 Nassau Street, New York 7, N. Y.
Apr. 20, 1917	BURHOP, WILLIAM H., Executive Vice-President, Employers Mutual Liability Insurance Company, 407 Grant Street, Wausau, Wis.
*Nov. 23, 1928	BURLING, WILLIAM H., Assistant Secretary, Group Department, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.
*Nov. 19, 1929	CAHILL, JAMES M., Secretary, National Bureau of Casualty Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 18, 1932	CAMERON, FREELAND R., Vice-President and General Manager, Public National Insurance Co., 420 Lincoln Road, Miami Beach 39, Florida.
†	CAMMACK, EDMUND E., Vice-President and Actuary, Aetna Life Insurance Company, Hartford 15, Conn.
*Nov. 17, 1938	CARLETON, JOHN W., Associate Actuary, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 17, Mass.
*Nov. 21, 1930	CARLSON, THOMAS O., Actuary, National Bureau of Casualty Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 13, 1936	CLEARY, ARTHUR E., 162 East 42nd Street, New York 17, N. Y.
*Nov. 15, 1918	COATES, BARRETT N., Coates and Herfurth, Consulting Actuaries, 620 Market Street, San Francisco 4, Calif.
*Nov. 17, 1922	COATES, CLARENCE S., Third Vice-President, Lumbermens Mutual Casualty Company, 4750 Sheridan Road, Chicago 40, Ill.
Oct. 27, 1916	COGSWELL, EDMUND S., First Deputy Commissioner of Insurance Department of Banking and Insurance, Division of Insurance, 100 Nashua Street, Boston 14, Mass.
Feb. 19, 1915	COLLINS, HENRY, (Retired), Timberlane, Route 4, Easton, Md.
*Nov. 23, 1928	COMSTOCK, W. PHILLIPS, Statistician, Preferred Accident Insurance Company, 80 Maiden Lane, New York 7, N. Y.
*Nov. 22, 1934	CONSTABLE, WILLIAM J., President and Treasurer, Excess Insurance Company of America, 99 John Street, New York 7, N. Y.
*Nov. 22, 1934	COOK, EDWIN A., Assistant General Manager and Secretary, Interboro Mutual Indemnity Insurance Company, 270 Madison Avenue, New York 16, N. Y.
†	COPELAND, JOHN A., Consulting Actuary, Candler Building, Atlanta, Ga.
*Nov. 18, 1925	CORCORAN, WILLIAM M., Partner, Wolfe, Corcoran & Linder, 116 John Street, New York 7, N. Y.
*Nov. 19, 1926	CRANE, HOWARD G., Vice-President and Treasurer, General Reinsurance Corporation, and North Star Reinsurance Corporation, 90 John Street, New York 7, N. Y.
*Nov. 22, 1946	CROUSE, CHARLES W., Actuary, Manufacturers Casualty Insurance Company, 1617 Pennsylvania Boulevard, Philadelphia 3, Pa.
*Nov. 18, 1932	DAVIES, E. ALFRED, (Retired) Falls Village, Conn.

## FELLOWS

Admitted	
*Nov. 18, 1927	DAVIS, EVELYN M., Woodward, Ryan, Sharp & Davis, Consulting Actuaries, 41 Park Row, New York 7, N. Y.
†	DeKAY, ECKFORD C., President, DeKay & Company, 84 William Street, New York 7, N. Y.
*Nov. 17, 1920	DORWEILER, PAUL, Actuary, Aetna Casualty & Surety Company, Hartford 15, Conn.
*Nov. 24, 1933	EDWARDS, JOHN, Actuary, Ontario Insurance Department, Parliament Buildings, Toronto 2, Ontario, Canada.
*Nov. 15, 1940	ELLIOTT, GEORGE B., General Manager, Pennsylvania Compensation Rating and Inspection Bureau, 938 Public Ledger Building, Independence Square, Philadelphia 6, Pa.
*Nov. 17, 1922	ELSTON, JAMES S., Assistant Actuary, Life Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
*Nov. 15, 1935	EPPINK, WALTER T., Vice-President, Merchants Mutual Casualty Co., Merchants Mutual Building, Buffalo 5, New York.
†	FACKLER, EDWARD B., Consulting Actuary, Fackler & Company, 8 West 40th Street, New York 18, N. Y.
†	FALLOW, EVERETT S., Actuary, Accident Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
*Nov. 15, 1940	FARLEY, JARVIS, Actuary and Assistant Treasurer, Massachusetts Indemnity Co., 632 Beacon Street, Boston 15, Mass.
†	FARRER, HENRY, Insurance Company of North America, 99 John Street, New York 7, N. Y.
*Nov. 15, 1935	FITZHUGH, GILBERT W., Third Vice-President, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.
Feb. 19, 1915	FONDILLER, RICHARD, Consulting Actuary, Woodward and Fondiller, 90 John Street, New York 7, N. Y.
†	FRANKLIN, CHARLES H., (Retired), 6225 Princeton Way, Hawthorne Hills, Seattle, Washington.
*Nov. 18, 1927	FREDRICKSON, CARL H., Actuary, Canadian Underwriters Association, 55 York Street, Toronto, Canada.
*Nov. 22, 1934	FULLER, GARDNER V., Third Vice-President and Risk Experience Manager, Special Risk Department, Lumbermens Mutual Casualty Co., and American Motorist Insurance Co., 4750 Sheridan Road, Chicago 40, Ill.
*Nov. 19, 1948	GARDINER, JAMES B., Manager, Group Contract Bureau, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.
Feb. 19, 1915	GARRISON, FRED S., Secretary, (Retired), 125 Whiting Lane, West Hartford, Conn.
*Nov. 20, 1924	GINSBURGH, HAROLD J., Vice-President, American Mutual Liability Insurance Co., 142 Berkeley Street, Boston 16, Mass.
*Nov. 21, 1930	GLENN, J. BRYAN, 5214 First Street, N.W., Washington 11, D.C.
*Nov. 13, 1931	GODDARD, RUSSELL P., Associate Actuary, American Mutual Liability Insurance Company, 142 Berkeley Street, Boston 16, Mass.

## FELLOWS

Admitted		
	†	GOODWIN, EDWARD S., 750 Main Street, Hartford 3, Conn.
*Nov.	19, 1926	GRAHAM, CHARLES M., Chief Self-Insurance Examiner, New York State Workmen's Compensation Board, 80 Center Street, New York 13, N. Y.
	†	GRAHAM, WILLIAM J., Consulting Actuary and Insurance Advisor, 1070 Park Avenue, New York 18, N. Y.
	†	GREENE, WINFIELD W., Executive Vice-President, General Reinsurance Corporation and North Star Reinsurance Corporation, 90 John Street, New York 7, N. Y.
	†	HAMMOND, H. PIERSON, (Retired), 22 Vanderbilt Road, West Hartford, Conn.
Oct.	27, 1916	HARDY, EDWARD R., Secretary-Emeritus, Insurance Institute of America, Inc., 80 John Street, New York 7, N. Y.
Oct.	22, 1915	HATCH, LEONARD W., (Retired), 425 Pelham Manor Road, Pelham Manor, New York.
*Nov.	19, 1926	HAUGH, CHARLES J., Secretary, Compensation and Liability Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
Oct.	22, 1915	HODGKINS, LEMUEL G., (Retired), 5 Whitman Road, Worcester 5, Mass.
Oct.	22, 1915	HOLLAND, CHARLES H., Suite 2001, 165 Broadway, New York 6, N. Y.
*Nov.	22, 1934	HOOKEE, RUSSELL O., Actuary and Director of Examinations, State of Connecticut Insurance Department, Hartford 2, Conn.
Nov.	18, 1932	HUEBNER, SOLOMON STEPHEN, Professor of Insurance, University of Pennsylvania, Philadelphia 4, Pa.
*Nov.	14, 1947	HUGHNEY, M. STANLEY, Procedures Co-ordinator, Lumbermens Mutual Casualty Company, 4750 Sheridan Road, Chicago 40, Ill.
	†	HUNTER, ARTHUR, (Retired), 124 Lloyd Road, Montclair, N. J.
Feb.	25, 1916	JACKSON, CHARLES W., (Retired), 74 Quimby Avenue, White Plains, N. Y.
*Nov.	19, 1929	JACKSON, HENRY HOLLISTER, Vice-President & Actuary, National Life Insurance Co., 131 State Street, Montpelier, Vt.
*Nov.	14, 1941	JOHNSON, ROGER A., JR., Actuary, Utica Mutual Insurance Co., 185 Genesee Street, Utica, N. Y.
*Nov.	16, 1939	JONES, HAROLD M., Group Research Division, John Hancock Mutual Life Insurance Company, 197 Clarendon Street, Boston 17, Mass.
*Nov.	17, 1938	KARDONSKY, ELSIE, 66 Corbin Place, Brooklyn 29, N. Y.
*Nov.	19, 1926	KELTON, WILLIAM H., Associate Actuary, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
*Nov.	21, 1919	KIRKPATRICK, A. LOOMIS, Manager Insurance Department, Chamber of Commerce of the U. S. A., 1615 H Street, N.W., Washington 6, D. C.
*Nov.	14, 1941	KOLE, MORRIS B., Associate Actuary, State Insurance Fund, 625 Madison Avenue, New York 22, N. Y.

## FELLOWS

Admitted		
*Nov. 24, 1933	KORMES, MARK, Consulting Actuary, 285 Madison Avenue, New York 17, N. Y.	
Nov. 23, 1928	KULP, CLARENCE A., Professor of Insurance, University of Pennsylvania, Logan Hall, 36th Street and Woodland Avenue, Philadelphia 4, Pa.	
Nov. 13, 1931	LA MONT, STEWART M., (Retired), Hotel Claremont, Berkeley, Cal.	
*Nov. 24, 1933	LANGE, JOHN R., Commissioner of Insurance, State of Wisconsin, State Capitol, Madison 2, Wis.	
†	LEAL, JAMES R., Vice-President and Secretary, Interstate Life and Accident Co., Interstate Building, 540 McCallie Avenue, Chattanooga 3, Tenn.	
†	LESLIE, WILLIAM, General Manager, National Bureau of Casualty Underwriters, 60 John Street, New York 7, N. Y.	
*Nov. 20, 1924	LINDER, JOSEPH, Consulting Actuary, Wolfe, Corcoran & Linder, 116 John Street, New York 7, N. Y.	
*Nov. 13, 1936	LYONS, DANIEL J., Second Vice-President, The Guardian Life Insurance Co. of America, 50 Union Square, New York 3, N. Y.	
†	MAGOUN, WILLIAM N., (Retired), 33 Fearing Road, Hingham, Mass.	
*Nov. 23, 1928	MARSHALL, RALPH M., Assistant Actuary, National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.	
*Nov. 18, 1927	MASTERTON, NORTON E., Vice-President and Actuary, Hardware Mutual Casualty Co. and Hardware Dealers Mutual Fire Insurance Co., 200 Strongs Avenue, Stevens Point, Wis.	
*Nov. 19, 1926	MATTHEWS, ARTHUR N., Assistant Actuary, Casualty Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.	
May 19, 1915	MAYCRINK, EMMA C., Secretary-Treasurer, Association of New York State Mutual Casualty Companies, 60 East 42nd Street, New York 17, N. Y.	
*Nov. 15, 1935	McCONNELL, MATTHEW H., Underwriter, Employers Mutual Liability Ins. Co., 12 S. 12th Street, Philadelphia 7, Pa.	
*Oct. 31, 1917	McMANUS, ROBERT J., Statistician, Casualty Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.	
†	MICHELbacher, G. F., President, Great American Indemnity Co., 1 Liberty Street, New York 5, N. Y.	
*Nov. 17, 1938	MILLER, JOHN HAYNES, Vice-President and Actuary, Monarch Life Insurance Company, 35 State St., Springfield 1, Mass.	
†	MILLIGAN, SAMUEL, Vice-President, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.	
*Nov. 18, 1937	MILLS, JOHN A., Vice-President and Actuary, Lumbermens Mutual Casualty Co. and American Motorists Insurance Co., Mutual Insurance Bldg., 4750 Sheridan Road, Chicago 40, Ill.	
*Nov. 18, 1921	MONTGOMERY, VICTOR, President, Pacific Employers Insurance Co., 1033 So. Hope Street, Los Angeles 15, Calif.	



## FELLOWS

Admitted		
	†	MOORE, GEORGE D., Actuary, National Association of Insurance Agents, 80 Maiden Lane, New York 7, N. Y.
	†	MOWBRAY, ALBERT H., (Deceased).
*Nov.	17, 1920	MUELLER, LOUIS H., 161 28th Ave., San Francisco 21, Calif.
	†	MULLANEY, FRANK R., Vice-President and Secretary, American Mutual Liability Insurance Co., 142 Berkeley Street, Boston 16, Mass.
May	28, 1920	MURPHY, RAY D., Vice-President and Actuary, The Equitable Life Assurance Society of the U. S. A., 393 Seventh Avenue, New York 1, N. Y.
*Nov.	15, 1935	OBERHAUS, THOMAS M., Consulting Actuary, Woodward and Fondiller, 90 John Street, New York 7, N. Y.
	†	OLIFIERS, EDWARD, Consulting Actuary, Caixa Postal 8, Pertopolis, Rio, Brazil.
	†	ORR, ROBERT K., 226 S. Logan Street, Lansing 15, Mich.
*Nov.	21, 1919	OUTWATER, OLIVE E., Actuary, Benefit Association of Railway Employees, 901 Montrose Avenue, Chicago 13, Ill.
*Nov.	21, 1930	PERRYMAN, FRANCIS S., Vice-President and Actuary, Eagle Indemnity Co., Globe Indemnity Co. and Royal Indemnity Co., 150 William Street, New York 8, N. Y.
*Nov.	14, 1941	PETERS, STEFAN, Lecturer, Statistical Laboratory, University of California, Berkeley 4, Calif.
Nov.	19, 1926	PHILLIPS, JESSE S., Chairman of Board, Great American Indemnity Co., 1 Liberty Street, New York 5, N. Y.
*Nov.	24, 1933	PICKETT, SAMUEL C., Rating Supervisor, Insurance Department, State of Connecticut, Hartford 2, Conn.
*Nov.	17, 1922	PINNEY, SYDNEY D., 290 Wolcott Hill Road, Wethersfield 9, Conn.
*Nov.	13, 1931	FRUITT, DUDLEY M., Actuary, General Accident Fire & Life Assurance Corp., Fourth & Walnut Sts., Philadelphia 5, Pa.
May	23, 1919	RICHARDSON, FREDERICK, Chairman of the Board, General Accident Fire and Life Assurance Corporation, Perth, Scotland.
*Nov.	19, 1926	RICHTER, OTTO C., Chief Statistician, American Telephone & Telegraph Co., 195 Broadway, New York 7, N. Y.
May	24, 1921	RIEGEL, ROBERT, Professor of Statistics and Insurance, University of Buffalo, Buffalo 14, New York.
*Nov.	14, 1947	RODERMUND, MATTHEW, Actuary and Assistant Comptroller, Interboro Mutual Indemnity Insurance Company, 270 Madison Avenue, New York 16, N. Y.
*Nov.	16, 1923	ROEBER, WILLIAM F., General Manager, National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.
*Nov.	14, 1947	ROSENBERG, NORMAN, Supervising Rate Analyst, California Insurance Department, 621 South Hope St., Los Angeles, Cal.
*Nov.	17, 1943	ROSS, SAMUEL M., Assistant Actuary, National Bureau of Casualty Underwriters, 60 John Street, New York 7, N. Y.

## FELLOWS

Admitted	
*Nov. 14, 1947	ROWELL, JOHN H., Group Insurance Actuary, Connecticut General Life Insurance Company, Hartford 2, Conn.
*Nov. 14, 1947	SALZMANN, RUTH E., Assistant Actuary, Hardware Mutual Casualty Company, Hardware Dealers Mutual Fire Insurance Co., 200 Strong's Ave., Stevens Point, Wis.
*Nov. 20, 1942	SATTERTHWAITE, FRANKLIN E., Quality Control Engineer, Product Service Division, General Electric Company, 1285 Boston Ave., Bridgeport 2, Conn.
*Nov. 19, 1948	SCHLOSS, HAROLD W., Actuarial Department, Royal-Liverpool Group, 150 William St., New York 8, N. Y.
*Nov. 18, 1937	SHAPIRO, GEORGE I., 934 E. 9th Street, Brooklyn 30, N. Y.
*Nov. 13, 1931	SILVERMAN, DAVID, Partner, Wolfe, Corcoran & Linder, 116 John Street, New York 7, N. Y.
*Nov. 24, 1933	SINNOTT, ROBERT V., Assistant Secretary, Hartford Accident and Indemnity Company, 690 Asylum Ave., Hartford 15, Conn.
*Nov. 19, 1929	SKELDING, ALBERT Z., Actuary, National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.
*Nov. 19, 1929	SKILLINGS, E. SHAW, Actuary, Allstate Insurance Co., 20 North Wacker Drive, Chicago 6, Ill.
*Nov. 18, 1932	SMICK, JACK J., Associate Actuary, Woodward and Fondiller, Consulting Actuaries, 90 John Street, New York 7, N. Y.
*Nov. 15, 1940	SMITH, SEYMOUR E., Assistant Secretary, Casualty Department, The Travelers Insurance Co., Hartford 15, Conn.
*Nov. 24, 1933	ST. JOHN, JOHN B., Associate Actuary, Towers, Perrin, Forster & Crosby, Inc., 12 South 12th Street, Philadelphia 7, Pa.
Nov. 18, 1927	STONE, EDWARD C., Chairman of the Board, American Employers' Insurance Company, 33 Broad St., Boston 9, Mass.
*Nov. 17, 1920	TARBELL, THOMAS F., Actuary, Casualty Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
†	THOMPSON, JOHN S., President, The Mutual Benefit Life Insurance Co., 300 Broadway, Newark 4, N. J.
†	TRAIN, JOHN L., President-General Manager, Utica Mutual Insurance Co., 185 Genesee Street, Utica 2, New York.
Nov. 17, 1922	TRAVERSI, ANTONIO T., Consulting Actuary and Accountant, Bank of Adelaide Chambers, Margaret St., Sydney, Australia.
*Nov. 19, 1948	TURNER, PAUL A., Assistant Chief Actuary, Joseph Froggatt & Co., Inc., 74 Trinity Place, New York 6, N. Y.
*Nov. 14, 1947	UHTHOFF, D. R., Assistant Actuary, National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.
*Nov. 23, 1928	VALERIUS, NELS M., Assistant Actuary, Aetna Casualty and Surety Co., Hartford 15, Conn.
*Nov. 21, 1919	VAN TUYL, HIRAM O., Superintendent, Internal Audit Department, London Guarantee & Accident Co., 55 Fifth Avenue, New York 3, N. Y.

## FELLOWS

Admitted		
*Nov. 17, 1920	WAITE, ALAN W., Secretary, The Aetna Casualty and Surety Co., 151 Farmington Ave., Hartford 15, Conn.	
*Nov. 15, 1935	WAITE, HARRY V., Actuary, The Travelers Fire Insurance Co., 700 Main Street, Hartford 15, Conn.	
*Nov. 18, 1925	WARREN, LLOYD A. H., Professor of Actuarial Science, University of Manitoba, 64 Niagara Street, Winnipeg, Manitoba, Canada.	
*Nov. 14, 1947	WIEDER, JOHN W., JR., Aetna Casualty and Surety Company, Hartford 15, Conn.	
*Nov. 15, 1935	WILLIAMS, HARRY V., Assistant Secretary, Hartford Accident and Indemnity Co., 690 Asylum Ave., Hartford 15, Conn.	
Nov. 14, 1941	WILLIAMSON, W., RULON, Senior Actuarial Consultant, The Wyatt Company, 3400 Fairhill Drive, Washington 20, D. C.	
*Nov. 13, 1931	WITTICK, HERBERT E., Secretary, Pilot Insurance Co., 199 Bay Street, Toronto 1, Canada.	
†	WOLFE, LEE J., Consulting Actuary, Wolfe, Corcoran & Linder, 116 John Street, New York 7, N. Y.	
May 24, 1921	WOOD, ARTHUR B., President, Sun Life Assurance Company of Canada, Montreal, Canada.	

## ASSOCIATES

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Those marked (\*) have been admitted as Associates upon examination by the Society.

Admitted	
May 23, 1924	ACKER, MILTON, Manager, General Liability Division, National Bureau of Casualty Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 15, 1918	ACKERMAN, SAUL B., Professor of Insurance, New York University, Washington Square, New York 6, N. Y.
*Nov. 16, 1939	AIN, SAMUEL N., Pension Trust Division, Bureau of Internal Revenue, Washington 25, D. C.
Apr. 5, 1928	ALLEN, AUSTIN F., President, Texas Employers' Insurance Association, 530 Interurban Building, P. O. Box 2759, Dallas 1, Texas.
Nov. 15, 1918	ANKERS, R. E., Vice-President and Treasurer, Continental Life Insurance Co., Inc., Investment Building, 15 and K Sts., N.W., Washington 5, D. C.
*Nov. 21, 1930	ARCHIBALD, A. EDWARD, Vice-President and Actuary, Volunteer State Life Insurance Company, Chattanooga 1, Tenn.
*Nov. 24, 1933	BARRON, JAMES C., Asst. Treasurer, General Reinsurance Corporation, 90 John Street, New York 7, N. Y.
*Nov. 23, 1928	BATEMAN, ARTHUR E., 121 Raymond Street, Cambridge, Mass.
*Nov. 15, 1940	BATHO, BRUCE, Associate Actuary, Life Insurance Company of Georgia, 573 W. Peachtree St., N.E., Atlanta 1, Georgia.
*Nov. 18, 1925	BITTEL, W. HAROLD, Chief Actuary, Department of Banking and Insurance, Trenton 7, New Jersey.
Nov. 17, 1920	BLACK, NELLAS C., Manager, Statistical Department, Maryland Casualty Co., Baltimore 3, Md.
*Nov. 15, 1940	BLACKHALL, JOHN M., California-Western States Life Insurance Company, 10th & J Sts., Sacramento, Calif.
*Nov. 22, 1934	BOMSE, EDWARD L., Supt. New York Met. Special Risks, Royal Indemnity Co., 150 William Street, New York 8, N. Y.
*Nov. 23, 1928	BOWER, P. S., Assistant General Manager and Treasurer, The Great-West Life Assurance Company, Winnipeg, Manitoba, Canada.
*Nov. 15, 1918	BRUNNQUELL, HELMUTH G., Assistant Actuary, The Northwestern Mutual Life Insurance Co., Milwaukee 2, Wis.
*Oct. 22, 1915	BUFFLER, LOUIS, Director, Underwriting Department, State Insurance Fund, 625 Madison Avenue, New York 22, N. Y.
*Nov. 20, 1924	BUGBEE, J. M., Manager, Automobile Department, Maryland Casualty Co., Box 1228, Baltimore 3, Md.
Mar. 31, 1920	BURT, MARGARET A., Office of George B. Buck, Consulting Actuary, 150 Nassau Street, New York 7, N. Y.
Nov. 17, 1922	CAVANAUGH, L. D., President, Federal Life Insurance Co., 168 N. Michigan Avenue, Chicago 1, Ill.

## ASSOCIATES

Admitted		
*Nov. 18, 1927	CHEN, S. T., Actuary, China United Assurance Society, 104 Bubbling Well Road, Shanghai, China.	
*Nov. 14, 1947	CLARKE, JOHN W., Assistant Actuary, Life Department, The Travelers Insurance Company, 700 Main Street, Hartford 15, Conn.	
*Nov. 24, 1933	CRAWFORD, W. H., Secretary, Fireman's Insurance Co. of Newark, N. J. & Affiliated Fire & Casualty Co.'s Pacific Dept., 220 Bush Street, San Francisco 6, Cal.	
*Nov. 18, 1932	CRIMMINS, JOSEPH B., Assistant Actuary, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.	
*Nov. 18, 1925	DAVIS, MALVIN E., Actuary, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.	
*Nov. 24, 1933	DAVIS, REGINALD S., Assistant Commissioner, Division of Real Estate, State of California, 1020 N Street, Sacramento, Calif.	
*Nov. 14, 1941	DOWLING, WILLIAM F., Asst. Treasurer, Lumber Mutual Casualty Co., 260 Fourth Avenue, New York 10, N. Y.	
June 5, 1925	EGER, FRANK A., Secretary-Comptroller, Indemnity Insurance Co. of North America, 1600 Arch Street, Philadelphia 1, Pa.	
*Nov. 16, 1923	FITZ, L. LEROY, Group Department, John Hancock Mutual Life Insurance Company, Boston 17, Mass.	
*Nov. 16, 1923	FLEMING, FRANK A., General Manager, Mutual Casualty Insurance Rating Bureau, 60 East 42nd Street, New York 17, N. Y.	
Nov. 20, 1924	FROBERG, JOHN, Manager, California Inspection Rating Bureau, 500 Sansome Street, San Francisco 11, Calif.	
*Nov. 13, 1936	FRUECHTEMAYER, FRED J., Assistant to Comptroller, The Andrew Jergens Company, 2535 Spring Grove Ave., Cincinnati 14, Ohio.	
*Nov. 19, 1929	FURNIVALL, MAURICE L., Assistant Actuary, Accident Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.	
*Nov. 14, 1947	GEORGE, HAROLD J., Assistant Actuary, National Life Insurance Co., 131 State St., Montpelier, Vt .	
*Nov. 18, 1932	GETMAN, RICHARD A., The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.	
*Nov. 17, 1922	GIBSON, JOSEPH P., JR., Manager, Casualty Department, American Foreign Insurance Association, 80 Maiden Lane, New York 7, N. Y.	
*Nov. 16, 1923	GILDEA, JAMES F., The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.	
*Nov. 14, 1947	GINGERY, STANLEY W., Assistant Actuary, The Prudential Insurance Co., Newark, N. J.	
*Nov. 18, 1927	GREEN, WALTER C., Consulting Actuary, Seventh Ave. and Berridge, Phoenix, Arizona.	
*Nov. 15, 1940	GROSSMAN, ELI A., Mathematician, United States Life Insurance Co., 84 William St., New York 7, N. Y.	

## ASSOCIATES

Admitted		
*Nov.	15, 1935	GUERTIN, ALFRED N., Actuary, American Life Convention, 230 N. Michigan Ave., Chicago 1, Ill.
*Nov.	16, 1939	HAGEN, OLAF E., Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
*Nov.	18, 1921	HAGGARD, ROBERT E., Supervisor, Permanent Disability Rating Bureau, Industrial Accident Commission, 965 Mission Street, San Francisco 3, Calif.
*Nov.	17, 1922	HALL, HARTWELL L., Associate Actuary, Connecticut Insurance Department, 165 Capitol Ave., Hartford 2, Conn.
*Nov.	13, 1936	HAM, HUGH P., Assistant General Manager, The British American Assurance Company, 22 Wellington St. East, Toronto 1, Canada.
Mar.	24, 1932	HARRIS, SCOTT, Executive Vice-President, Joseph Froggatt & Co., Inc., 74 Trinity Place, New York 6, N. Y.
*Mar.	25, 1924	HART, WARD VAN B., Assistant Actuary, Connecticut General Life Insurance Co., 55 Elm St., Hartford 15, Conn.
Nov.	21, 1919	HAYDON, GEORGE F., General Manager, Wisconsin Compensation Rating & Inspection Bureau, 715 N. Van Buren St., Milwaukee 2, Wis.
*Nov.	19, 1948	HEWITT, CHARLES C., JR., New Jersey Manufacturers Casualty Insurance Co., 363 W. State St., Trenton, N. J.
Nov.	17, 1927	HIPP, GRADY H., Executive Vice-President, Liberty Life Insurance Co., Greenville, S. C.
*Nov.	16, 1945	HOLZINGER, ERNEST, Actuary, Pension Planning Company, 527 Fifth Avenue, New York 17, N. Y.
Nov.	19, 1929	JACOBS, CARL N., President, Hardware Mutual Casualty Co., 200 Strongs Ave., Stevens Point, Wis.
*Nov.	18, 1921	JENSEN, EDWARD S., Assistant Secretary, Group Department, Occidental Life Insurance Co. of California, 1151 So. Broadway, Los Angeles 55, Calif.
Nov.	21, 1930	JONES, H. LLOYD, Executive Vice-President and Deputy General Attorney, Phoenix-London Group, 55 Fifth Avenue, New York 3, N. Y.
*Nov.	21, 1919	JONES, LORING D., (Retired), 64 Raymond Ave., Rockville Centre, Long Island, N. Y.
*Nov.	15, 1940	KELLY, ROBERT G., Mathematician, Allied Physics Laboratory, Johns Hopkins University, 3621 Georgia Ave., Silver Spring, Md.
*Nov.	17, 1922	KIRK, CARL L., Assistant U. S. Manager, Zurich General Accident & Liability Insurance Co., 135 South LaSalle Street, Chicago 3, Ill.
*Nov.	15, 1935	KITZROW, E. W., Vice-President, Underwriting and Auditing, Hardware Mutual Casualty Co., 200 Strongs Ave., Stevens Point, Wis.
*Nov.	16, 1939	KNOWLES, FREDERICK, 5724 Mountain Sights Ave., N. D. G., Montreal, Canada.

## ASSOCIATES

Admitted	
*Nov. 18, 1937	LASSOW, WILLIAM, Administrative Assistant, Executive Department, Board of Transportation, 250 Hudson Street, New York 13, N. Y.
*Nov. 17, 1938	LIEBLEIN, JULIUS, Mathematician, Statistical Engineering Laboratory, Room 302, South Building, National Bureau of Standards, Washington 25, D. C.
*Nov. 19, 1948	LIVINGSTON, GILBERT, National Bureau of Casualty Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 14, 1947	LUFKIN, ROBERT W., Liberty Mutual Insurance Co., 175 Berkley Street, Boston, Mass.
*Nov. 13, 1931	MACKEEN, HAROLD E., Casualty Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
Mar. 24, 1932	MAGRATH, JOSEPH J., Administrative Assistant, Chubb & Son, 90 John Street, New York 7, N. Y.
*Nov. 18, 1925	MALMUTH, JACOB, Examiner, New York State Insurance Department, 61 Broadway, New York 6, N. Y.
Mar. 24, 1927	MARSH, CHARLES V. R., (Retired), 617 E. Surf Road, Ocean City, N. J.
*Nov. 13, 1936	MAYER, WILLIAM H., JR., Actuarial Department, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.
*Nov. 17, 1922	MCIVER, R. A., Actuary, Washington National Insurance Co., 610 Church Street, Evanston; Ill.
*Nov. 17, 1922	MICHENER, SAMUEL M., Actuary, Columbus Mutual Life Insurance Co., 303 East Broad Street, Columbus 16, Ohio.
*Nov. 13, 1931	MILLER, HENRY C., Comptroller-Actuary, California State Compensation Insurance Fund, 450 McAllister Street, San Francisco 2, Calif.
*Nov. 19, 1926	MILNE, JOHN L., Actuary, Philadelphia Life Insurance Company, 111 North Broad Street, Philadelphia 7, Pa.
Nov. 17, 1922	MONTGOMERY, JOHN C., Secretary and Treasurer, Bankers Indemnity Insurance Co., 15 Washington Street, Newark 2, N. J.
May 25, 1923	MOORE, JOSEPH P., President, North American Accident Insurance Co., 455 Craig Street, W., Montreal, Canada.
*Nov. 21, 1919	MOTHERSILL, ROLLAND V., Chairman of the Board, Anchor Casualty Co., Anchor Insurance Building, 2700 University Avenue, St. Paul 4, Minn.
*Nov. 14, 1947	MUNTERICH, GEORGE C., Lumber Mutual Casualty Insurance Company of New York, 260 Fourth Ave., New York 10, N. Y.
*Nov. 18, 1937	MYERS, ROBERT J., Chief Actuary, Social Security Administration, Washington 25, D. C.
*Nov. 15, 1935	NELSON, S. TYLER, Casualty Actuary, Department of Insurance, State Capitol Building, Springfield, Ill.
*Oct. 27, 1916	NEWELL, WILLIAM, (Retired), 1225 Park Avenue, New York 28, N. Y.
*Nov. 18, 1925	NICHOLSON, EARL, Actuary, Joseph Froggatt & Co., Inc., 74 Trinity Place, New York 6, N. Y.

## ASSOCIATES

Admitted	
May 23, 1919	OTTO, WALTER E., President, Michigan Mutual Liability Co., Associated General Fire Co., 163 Madison Avenue, Detroit 26, Mich.
*Nov. 19, 1926	OVERHOLSER, DONALD M., Office of George B. Buck, Consulting Actuary, 150 Nassau Street, New York 7, N. Y.
Nov. 20, 1924	PENNOCK, RICHARD M., Actuary, Pennsylvania Manufacturers' Association Casualty Insurance Co., Finance Building, Philadelphia 2, Pa.
*Nov. 14, 1947	PERRY, ROBERT C., Vice-President and Actuary, State Farm Life Insurance Company, Bloomington, Ill.
Nov. 19, 1929	PHILLIPS, JOHN H., Vice-President and Actuary, Employers' Mutual Liability Insurance Co., 407 Grant St., Wausau, Wis.
*Nov. 17, 1920	PIKE, MORRIS, Associate Actuary, John Hancock Mutual Life Insurance Co., Boston 17, Mass.
*Nov. 23, 1928	PIPER, K. B., Vice-President, Provident Life and Accident Insurance Co., 721 Broad St., Chattanooga 2, Tenn.
*Nov. 17, 1922	POORMAN, WILLIAM F., President, Central Life Assurance Society (Mutual), Fifth and Grand Avenues, Des Moines 6, Iowa.
*Nov. 13, 1936	POTOFSKY, SYLVIA, Senior Actuary, The State Insurance Fund, 625 Madison Avenue, New York 22, N. Y.
*Nov. 15, 1918	RAYWID, JOSEPH, President, Joseph Raywid & Co., Inc., 92 William Street, New York 7, N. Y.
*Nov. 19, 1948	RESONY, JOHN A., Research Associate, Connecticut State Highway Department, State Office Building, Hartford, Conn.
Nov. 19, 1932	RICHARDSON, HARRY F., Secretary-Treasurer, National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.
*Nov. 18, 1932	ROBERTS, JAMES A., Life Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
*Nov. 18, 1927	SARASON, HARRY M., Associate Actuary, General American Life Insurance Co., 1501 Locust Street, St. Louis 3, Mo.
Nov. 16, 1923	SAWYER, ARTHUR, Royal Indemnity Co., 150 William Street, New York 8, N. Y.
*Nov. 14, 1947	SCAMMON, LAWRENCE W., Actuary, Massachusetts Automobile Rating and Accident Prevention Bureau, Massachusetts Workmen's Compensation Rating and Inspection Bureau, 89 Broad Street, Boston 10, Mass.
*Nov. 14, 1947	SCHWARTZ, MAX J., Examiner, New York State Insurance Department, Albany 1, N. Y.
*Nov. 20, 1930	SEVILLA, EXEQUIEL S., Manager and Actuary, National Life Insurance Co. of the Philippines, Regina Building, P.O. Box 2056, Manila, Philippines.
*Nov. 20, 1924	SHEPPARD, NORRIS E., Professor of Mathematics, University of Toronto, Toronto 5, Canada.
Nov. 15, 1918	SIBLEY, JOHN L., Assistant Secretary, United States Casualty Co., 60 John Street, New York 7, N. Y.



## ASSOCIATES

Admitted	
*Nov. 18, 1921	SMITH, ARTHUR G., Assistant General Manager, Compensation Insurance Rating Board, Pershing Square Bldg., 125 Park Avenue, New York 17, N. Y.
*Nov. 19, 1926	SOMERVILLE, WILLIAM F., Secretary, St. Paul Mercury Indemnity Co., St. Paul 2, Minn.
*Nov. 18, 1925	SOMMER, ARMAND, Supt. of Agencies, Continental Casualty Co., 910 So. Michigan Avenue, Chicago 5, Ill.
*Nov. 15, 1918	SPENCER, HAROLD S., Statistician, Aetna Casualty and Surety Co., 151 Farmington Ave., Hartford 15, Conn.
Nov. 20, 1924	STELLWAGEN, H. P., Executive Vice-President, Indemnity Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.
*Nov. 16, 1923	STOKE, KENDRICK, Actuary, Michigan Mutual Liability Company, 163 Madison Avenue, Detroit 26, Mich.
*Nov. 21, 1930	SULLIVAN, WALTER F., Assistant Actuary, State Compensation Insurance Fund, 450 McAllister Street, San Francisco 1, Calif.
*Nov. 21, 1919	TRENCH, FREDERICK H., Manager, Underwriting Department, Utica Mutual Insurance Co., 185 Genesee Street, Utica 1, N. Y.
*Nov. 20, 1924	UHL, M. ELIZABETH, National Bureau of Casualty Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 14, 1947	VERGANO, ELIA, Assistant Actuary, Compensation Insurance Rating Board, 125 Park Avenue, New York 17, N. Y.
May 23, 1919	WARREN, CHARLES S., Secretary, Massachusetts Automobile Rating and Accident Prevention Bureau, 89 Broad Street, Boston 10, Mass.
*Nov. 18, 1932	WEINSTEIN, MAX S., Actuary, New York State Employees' Retirement System, 256 Washington Ave., Albany 1, N. Y.
*Nov. 18, 1925	WELLMAN, ALEXANDER C., Vice-President, Protective Life Insurance Co., Birmingham, Ala.
*Nov. 21, 1930	WELLS, WALTER I., Assistant Actuary, State Mutual Life Assurance Co., 340 Main St., Worcester 8, Mass.
Mar. 21, 1929	WHEELER, CHARLES A., Chief Examiner of Casualty Companies, New York State Insurance Department, 61 Broadway, New York 6, N. Y.
*Nov. 18, 1927	WHITBREAD, F. G., Vice-President, Reliance Life Insurance Company, Room 412, Farmers Bank Building, Pittsburgh 22, Pa.
*Nov. 19, 1948	WHITE, AUBREY, Assistant Actuary, Paul Revere Life Insurance Co., 18 Chestnut St., Worcester, Mass.
*Nov. 16, 1939	WITTLAKE, J. CLARKE, Assistant to President, Business Men's Assurance Company, B.M.A. Building, Kansas City 10, Mo.
*Nov. 14, 1947	WOLFRUM, RICHARD J., Assistant Actuary, Liberty Mutual Insurance Company, 175 Berkley Street, Boston 17, Mass.
*Oct. 22, 1915	WOOD, DONALD M., Partner, Childs & Wood, 175 W. Jackson Blvd., Chicago 4, Ill.

## ASSOCIATES

Admitted	
*Nov. 18, 1937	WOOD, DONALD M., JR., Childs & Wood, 175 West Jackson Blvd., Chicago 4, Ill.
*Nov. 18, 1927	WOOD, MILTON J., Associate Actuary, The Travelers Insurance Co., 700 Main Street, Hartford 15, Conn.
*Oct. 22, 1915	WOODMAN, CHARLES E., (Retired), 75 Norman Place, Tenafly, N. J.
*Nov. 22, 1934	WOODWARD, BARBARA H., Associate Lawyer, Hughes, Hubbard & Ewing, 1 Wall Street, New York 5, N. Y.
*Nov. 18, 1925	WOOLERY, JAMES MYRON, Vice-President and Actuary, Occidental Life Insurance Company, Raleigh, North Carolina.

## SCHEDULE OF MEMBERSHIP, NOVEMBER 19, 1948

	Fellows	Associates	Total
Membership, November 14, 1947 .....	155	127	282
Additions:			
By election .....	1	---	1
By reinstatement .....	---	---	---
By examination .....	3	4	7
	159	131	290
Deductions:			
By death .....	5	2	7
By withdrawal .....	1	2	3
By transfer from Associate to Fellow .....	---	3	3
Membership, November 19, 1948 .....	153	124	277

## OFFICERS OF THE SOCIETY

Since Date of Organization

<i>Elected</i>	<i>President</i>	<i>Vice-Presidents</i>	
1914-1915	*Isaac M. Rubinow	*Albert H. Mowbray	*Benedict D. Flynn
1916-1917	*James D. Craig	*Joseph H. Woodward	*Harwood E. Ryan
1918	*Joseph H. Woodward	*Benedict D. Flynn	George D. Moore
1919	*Benedict D. Flynn	George D. Moore	William Leslie
1920	*Albert H. Mowbray	William Leslie	*Leon S. Senior
1921	*Albert H. Mowbray	*Leon S. Senior	*Howard E. Ryan
1922	*Harwood E. Ryan	Gustav F. Michelbacher	Edmund E. Cammack
1923	William Leslie	Gustav F. Michelbacher	Edmund E. Cammack
1924-1925	Gustav F. Michelbacher	*Sanford B. Perkins	Ralph H. Blanchard
1926-1927	*Sanford B. Perkins	George D. Moore	Thomas F. Tarbell
1928-1929	George D. Moore	Sydney D. Pinney	Paul Dorweiler
1930-1931	Thomas F. Tarbell	*Roy A. Wheeler	Winfield W. Greene
1932-1933	Paul Dorweiler	William F. Roeber	*Leon S. Senior
1934-1935	Winfield W. Greene	Ralph H. Blanchard	Charles J. Haugh
1936-1937	*Leon S. Senior	Sydney D. Pinney	Francis S. Perryman
1938-1939	Francis S. Perryman	Harmon T. Barber	William J. Constable
1940	Sydney D. Pinney	Harold J. Ginsburgh	James M. Cahill
1941	Ralph H. Blanchard	Harold J. Ginsburgh	James M. Cahill
1942	Ralph H. Blanchard	Albert Z. Skelding	Charles J. Haugh
1943-1944	Harold J. Ginsburgh	Albert Z. Skelding	Charles J. Haugh
1945-1946	Charles J. Haugh	James M. Cahill	Harry V. Williams
1947-1948	James M. Cahill	Harmon T. Barber	Russell P. Goddard

*Secretary-Treasurer*

1914-1917....\*C. E. Scattergood

1918-1948.....R. Fondiller

*Editor†*

1914.....	W. W. Greene
1915-1917.....	R. Fondiller
1918.....	W. W. Greene
1919-1921....	G. F. Michelbacher
1922-1923.....	O. E. Outwater
1924-1932.....	R. J. McManus
1933-1943.....	*C. W. Hobbs
1944-1948.....	E. C. Maycrink

*Librarian†*

1914.....	W. W. Greene
1915.....	R. Fondiller
1916-1921.....	L. I. Dublin
1922-1924.....	E. R. Hardy
1925-1937.....	W. Breiby
1937-1947.....	T. O. Carlson
1948.....	S. M. Ross

\*Deceased.

†The offices of Editor and Librarian were not separated until 1916.

## FELLOWS WHO HAVE DIED

The (†) denotes charter members at date of organization, November 7, 1914.

Admitted		Died
May 24, 1921	Edward J. Bond	Nov. 12, 1941
May 19, 1915	Thomas Bradshaw	Nov. 10, 1939
June 5, 1925	William Brosmith	Aug. 22, 1937
†	William A. Budlong	June 4, 1934
Nov. 18, 1932	Charles H. Burhans	June 15, 1942
Feb. 19, 1915	F. Highlands Burns	Mar. 30, 1935
†	Raymond V. Carpenter	Mar. 11, 1947
Feb. 19, 1915	Gorden Case	Feb. 4, 1920
†	Charles T. Conway	July 23, 1921
†	Walter G. Cowles	May 30, 1942
†	James D. Craig	May 27, 1940
†	James McIntosh Craig	Jan. 20, 1922
May 26, 1916	Frederick S. Crum	Sept. 2, 1921
†	Alfred Burnett Dawson	June 21, 1931
†	Miles Menander Dawson	Mar. 27, 1942
†	Elmer H. Dearth	Mar. 26, 1947
May 19, 1915	Samuel Deutschberger	Jan. 18, 1929
†	Ezekiel Hinton Downey	July 9, 1922
May 19, 1915	Earl O. Dunlap	July 5, 1944
†	David Parks Fackler	Oct. 30, 1924
Feb. 19, 1915	Claude W. Fellows	July 15, 1938
†	Benedict D. Flynn	Aug. 22, 1944
†	Charles S. Forbes	Oct. 2, 1943
May 26, 1916	Lee K. Frankel	July 25, 1931
Feb. 25, 1916	Joseph Froggatt	Sept. 28, 1940
†	Harry Furze	Dec. 26, 1945
†	Theodore E. Gaty	Aug. 22, 1925
May 19, 1915	James W. Glover	July 15, 1941
Oct. 22, 1915	George Graham	Apr. 15, 1937
Oct. 22, 1915	Thompson B. Graham	July 24, 1946
May 25, 1923	William A. Granville	Feb. 4, 1943
†	William H. Gould	Oct. 28, 1936
†	Robert Cowen Lees Hamilton	Nov. 15, 1941
Nov. 21, 1919	Robert Henderson	Feb. 16, 1942
†	Robert J. Hillas	May 17, 1940
Nov. 15, 1918	Frank Webster Hinsdale	Mar. 18, 1932
May 23, 1924	Clarence W. Hobbs	July 21, 1944
Nov. 19, 1926	Charles E. Hodges	Jan. 22, 1937
†	Frederick L. Hoffman	Feb. 23, 1946
Nov. 21, 1919	Carl Hookstadt	Mar. 10, 1924
†	Charles Hughes	Aug. 27, 1948
Nov. 19, 1929	Robert S. Hull	Nov. 30, 1947
†	Burritt A. Hunt	Sept. 3, 1943
Nov. 28, 1921	William Anderson Hutcheson	Nov. 19, 1942
May 19, 1915	William C. Johnson	Oct. 7, 1943
Nov. 23, 1928	F. Robertson Jones	Dec. 26, 1941
Nov. 18, 1921	Thomas P. Kearney	Feb. 11, 1928
Oct. 22, 1915	Virgil Morrison Kime	Oct. 15, 1912
Nov. 19, 1926	Gregory Cook Kelly	Sept. 11, 1948

## FELLOWS WHO HAVE DIED—*Continued*

Admitted		<i>Died</i>
	Edwin W. Kopf	Aug. 3, 1938
Feb. 17, 1915	John M. Laird	June 20, 1942
Feb. 19, 1915	Abb Landis	Dec. 9, 1937
Nov. 17, 1922	Arnette Roy Lawrence	Dec. 1, 1942
Nov. 18, 1921	James Fulton Little	Aug. 11, 1938
Nov. 23, 1928	Edward C. Lunt	Jan. 13, 1941
Feb. 19, 1915	Harry Lubin	Dec. 20, 1920
Nov. 16, 1923	D. Ralph McClurg	Apr. 27, 1947
May 23, 1919	Alfred McDougald	July 28, 1944
Feb. 15, 1915	Franklin B. Mead	Nov. 29, 1933
Apr. 20, 1917	Marcus Meltzer	Mar. 27, 1931
	† David W. Miller	Jan. 18, 1936
	† James F. Mitchell	Feb. 9, 1941
	† Henry Moir	June 8, 1937
Nov. 19, 1926	William L. Mooney	Oct. 21, 1948
Feb. 19, 1915	William J. Montgomery	Aug. 20, 1915
May 19, 1915	Edward Bontecou Morris	Dec. 19, 1929
	† Lewis A. Nicholas	Apr. 21, 1940
	† Stanley L. Otis	Oct. 12, 1937
Nov. 13, 1926	Bertrand A. Page	July 30, 1941
Nov. 18, 1921	Sanford B. Perkins	Sept. 16, 1945
Nov. 15, 1918	William Thomas Perry	Oct. 25, 1940
	† Edward B. Phelps	July 24, 1915
	† Charles Grant Reiter	July 30, 1937
	† Charles H. Remington	Mar. 21, 1938
	† Isaac M. Rubinow	Sept. 1, 1936
	† Harwood Eldridge Ryan	Nov. 2, 1930
	† Arthur F. Saxton	Feb. 26, 1927
	† Emil Scheitlin	May 2, 1946
	† Leon S. Senior	Feb. 3, 1940
Apr. 20, 1917	Charles Gordon Smith	June 22, 1938
Feb. 19, 1915	John T. Stone	May 9, 1920
Feb. 25, 1916	Wendell Menville Strong	Mar. 30, 1942
Oct. 22, 1915	William R. Strong	Jan. 10, 1946
	† Robert J. Sullivan	July 19, 1934
Nov. 22, 1934	Walter H. Thompson	May 25, 1935
Nov. 18, 1921	Guido Toja	Feb. 28, 1933
May 23, 1919	Archibald A. Welch	May 8, 1945
Nov. 19, 1926	Roy A. Wheeler	Aug. 26, 1932
	† Albert W. Whitney	July 27, 1943
	† S. Herbert Wolfe	Dec. 31, 1927
	† Joseph H. Woodward	May 15, 1928
	† William Young	Oct. 23, 1927

## ASSOCIATES WHO HAVE DIED

<i>Admitted</i>		<i>Died</i>
Oct. 22, 1915	Don A. Baxter	Feb. 10, 1920
May 25, 1923	Harilaus E. Economidy	Apr. 13, 1948
Nov. 22, 1934	John J. Gately	Nov. 3, 1943
Nov. 19, 1929	Harold R. Gordon	July 8, 1948
Nov. 20, 1924	Leslie LeVant Hall	Mar. 8, 1931
Oct. 31, 1917	Edward T. Jackson	May 8, 1939
Nov. 19, 1929	Fritz Muller	Apr. 27, 1945
Nov. 23, 1928	Karl Newhall	Oct. 24, 1944
Nov. 18, 1927	Alexander A. Speers	June 25, 1941
Mar. 23, 1921	Arthur E. Thompson	Jan. 17, 1944
Nov. 21, 1919	Walter G. Voogt	May 8, 1945
Nov. 18, 1925	James H. Washburn	Aug. 19, 1946
Nov. 17, 1920	James J. Watson	Feb. 23, 1937
Nov. 18, 1921	Eugene R. Welch	Jan. 17, 1945
Nov. 15, 1918	Albert Edward Wilkinson	June 11, 1930

## CONSTITUTION

(AS AMENDED NOVEMBER 15, 1940)

### ARTICLE I.—*Name.*

This organization shall be called the CASUALTY ACTUARIAL SOCIETY.

### ARTICLE II.—*Object.*

The object of the Society shall be the promotion of actuarial and statistical science as applied to the problems of casualty and social insurance by means of personal intercourse, the presentation and discussion of appropriate papers, the collection of a library and such other means as may be found desirable.

The Society shall take no partisan attitude, by resolution or otherwise, upon any question relating to casualty or social insurance.

### ARTICLE III.—*Membership.*

The membership of the Society shall be composed of two classes, Fellows and Associates. Fellows only shall be eligible to office or have the right to vote.

The Fellows of the Society shall be the present Fellows and those who may be duly admitted to Fellowship as hereinafter provided. The Associates shall be the present Associates and those who may be duly admitted to Associateship as hereinafter provided.

Any person may, upon nomination to the Council by two Fellows of the Society and approval by the Council of such nomination with not more than one negative vote, become enrolled as an Associate of the Society, provided that he shall pass such examination as the Council may prescribe. Such examination may be waived in the case of a candidate who for a period of not less than two years has been in responsible charge of the Statistical or Actuarial Department of a casualty insurance organization or has had such other practical experience in casualty or social insurance as, in the opinion of the Council renders him qualified for Associateship.

Any person who shall have qualified for Associateship may become a Fellow on passing such final examination as the Council may prescribe. Otherwise, no one shall be admitted as a Fellow unless recommended by a duly called meeting of the Council with not more than three negative votes, followed by a three-fourths ballot of the Fellows present and voting at a meeting of the Society.

### ARTICLE IV.—*Officers and Council.*

The officers of the Society shall be a President, two Vice-Presidents, a Secretary-Treasury, an Editor, and a Librarian. The Council shall be composed of the active officers, nine other Fellows and, during the four years following the expiration of their terms of office, the ex-Presidents and ex-Vice-Presidents. The Council shall fill vacancies occasioned by death or resignation of any officer or other member of the Council, such appointees to serve until the next annual meeting of the Society.

## CONSTITUTION

ARTICLE V.—*Election of Officers and Council.*

The President, Vice-Presidents, and the Secretary-Treasurer shall be elected by a majority ballot at the annual meeting for the term of one year and three members of the Council shall, in a similar manner, be annually elected to serve for three years. The President and Vice-Presidents shall not be eligible for the same office for more than two consecutive years nor shall any retiring member of the Council be eligible for re-election at the same meeting.

The Editor and the Librarian shall be elected annually by the Council at the Council meeting preceding the annual meeting of the Society. They shall be subject to confirmation by majority ballot of the Society at the annual meeting.

The terms of the officers shall begin at the close of the meeting at which they are elected except that the retiring Editor shall retain the powers and duties of office so long as may be necessary to complete the then current issue of *Proceedings*.

ARTICLE VI.—*Duties of Officers and Council.*

The duties of the officers shall be such as usually appertain to their respective offices or may be specified in the by-laws. The duties of the Council shall be to pass upon candidates for membership, to decide upon papers offered for reading at the meetings, to supervise the examination of candidates and prescribe fees therefor, to call meetings, and in general, through the appointment of committees and otherwise, to manage the affairs of the Society.

ARTICLE VII.—*Meetings.*

There shall be an annual meeting of the Society on such date in the month of November as may be fixed by the Council in each year, but other meetings may be called by the Council from time to time and shall be called by the President at any time upon the written request of ten Fellows. At least two weeks notice of all meetings shall be given by the Secretary.

ARTICLE VIII.—*Quorum.*

Seven members of the Council shall constitute a quorum. Twenty Fellows of the Society shall constitute a quorum.

ARTICLE IX.—*Expulsion or Suspension of Members.*

Except for non-payment of dues no member of the Society shall be expelled or suspended save upon action by the Council with not more than three negative votes followed by a three-fourths ballot of the Fellows present and voting at a meeting of the Society.

ARTICLE X.—*Amendments.*

This constitution may be amended by an affirmative vote of two-thirds of the Fellows present at any meeting held at least one month after notice of such proposed amendment shall have been sent to each Fellow by the Secretary.



## BY-LAWS

(AS AMENDED NOVEMBER 22, 1946)

### ARTICLE I.—*Order of Business.*

At a meeting of the Society the following order of business shall be observed unless the Society votes otherwise for the time being:

1. Calling of the roll.
2. Address or remarks by the President.
3. Minutes of the last meeting.
4. Report by the Council on business transacted by it since the last meeting of the Society.
5. New Membership.
6. Reports of officers and committees.
7. Election of officers and Council (at annual meetings only).
8. Unfinished business.
9. New business.
10. Reading of papers.
11. Discussion of papers.

### ARTICLE II.—*Council Meetings.*

Meetings of the Council shall be called whenever the President or three members of the Council so request, but not without sending notice to each member of the Council seven or more days before the time appointed. Such notice shall state the objects intended to be brought before the meeting, and should other matter be passed upon, any member of the Council shall have the right to re-open the question at the next meeting.

### ARTICLE III.—*Duties of Officers.*

The President, or, in his absence, one of the Vice-Presidents, shall preside at meetings of the Society and of the Council. At the Society meetings the presiding officer shall vote only in case of a tie, but at the Council meetings he may vote in all cases.

The Secretary-Treasurer shall keep a full and accurate record of the proceedings at the meetings of the Society and of the Council, send out calls for the said meetings, and, with the approval of the President and Council, carry on the correspondence of the Society. Subject to the direction of the Council, he shall have immediate charge of the office and archives of the Society.

The Secretary-Treasurer shall also send out calls for annual dues and acknowledge receipt of same; pay all bills approved by the President for expenditures authorized by the Council of the Society; keep a detailed account of all receipts and expenditures, and present an abstract of the same at the annual meetings, after it has been audited by a committee of the Council.

## BY-LAWS

The Editor shall, under the general supervision of the Council, have charge of all matters connected with editing and printing the Society's publications. The *Proceedings* shall contain only the proceedings of the meetings, original papers or reviews written by members, discussions on said papers and other matter expressly authorized by the Council.

The Librarian shall, under the general supervision of the Council, have charge of the books, pamphlets, manuscripts and other literary or scientific material collected by the Society.

ARTICLE IV.—*Dues.*

The Council shall fix the annual dues for Fellows and for Associates. The payment of dues will be waived in the case of Fellows or Associates who have attained the age of seventy years or who, having been members for a period of at least twenty years, shall have attained the age of sixty-five years. Fellows and Associates who have become totally disabled while members may upon approval of the Council be exempted from the payment of dues during the period of disability.

It shall be the duty of the Secretary-Treasurer to notify by mail any Fellow or Associate whose dues may be six months in arrears, and to accompany such notice by a copy of this article. If such Fellow or Associate shall fail to pay his dues within three months from the date of mailing such notice, his name shall be stricken from the rolls, and he shall thereupon cease to be a Fellow or Associate of the Society. He may, however, be reinstated by vote of the Council, and upon payment of arrears of dues.

ARTICLE V.—*Designation by Initials.*

Fellows of the Society are authorized to append to their names the initials F.C.A.S.; and Associates are authorized to append to their names the initials A.C.A.S.

ARTICLE VI.—*Amendments.*

These by-laws may be amended by an affirmative vote of two-thirds of the Fellows present at any meeting held at least one month after notice of the proposed amendment shall have been sent to each Fellow by the Secretary.

## SYLLABUS OF EXAMINATIONS

(Effective 1948 and Thereafter)

## ASSOCIATESHIP

<i>Part</i>	<i>Sections</i>	<i>Subjects</i>
I	1	Descriptive and Analytical Statistics.
	2	Compound Interest and Annuities Certain.
II	3	Differential and Integral Calculus.
	4	Calculus of Finite Differences.
III	5	Probabilities.
	6	Life Contingencies, Life Annuities and Life Assurances.
IV	7	Policy Forms and Underwriting Practice in Casualty Insurance.
	8	Casualty Insurance Rate Making Methods.

## FELLOWSHIP

I	9	Insurance Economics.
	10	Insurance Law and Regulation.
II	11	Individual Risk Rating.
	12	Social Insurance.
III	13	Determination of Premium, Loss and Expense Reserves.
	14	Advanced Problems in Casualty Insurance Statistics.
IV	15	Advanced Problems in Casualty Insurance Accounting.
	16	Advanced Problems in the Underwriting and Administration of Casualty Insurance.

## RULES REGARDING EXAMINATIONS FOR ADMISSION TO THE CASUALTY ACTUARIAL SOCIETY

### 1. **Dates of Examination.**

Examinations will be held on the second Tuesday and following Wednesday during the month of May in each year in such cities as will be convenient for three or more candidates.

### 2. **Filing of Application.**

Application for admission to examination should be made on the Society's blank form, which may be obtained from the Secretary-Treasurer. No applications will be considered unless received before the fifteenth day of February preceding the dates of examination. Applications should definitely state for what parts the candidate will appear.

### 3. **Fees.**

The examination fee is \$3.00 for each part or portion thereof taken, subject to a minimum of \$5.00 for each year in which the candidate presents himself; thus for one part, \$5.00, for two parts, \$6.00, etc. Examination fees are payable to the order of the Society and must be received by the Secretary-Treasurer before the fifteenth day of February preceding the dates of examination.

### 4. **Associateship and Fellowship Examinations.**

(a) The examination for Associateship consists of four parts and that for Fellowship consists of four parts. A candidate may take any one or more of the four parts of the Associateship Examination. A candidate may present himself for part of the Fellowship Examination either (a) if he has previously passed the Associateship Examination and all preceding parts of the Fellowship Examination, or (b) if he concurrently presents himself for and submits papers for all unpassed parts of the Associateship Examination and all preceding unpassed parts of the Fellowship Examination. Subject to the foregoing requirements, the candidate will be given credit for any part or parts of either examination which he may pass.

(b) A candidate who has passed the Associateship Examination Parts I-IV prior to 1941, but who has not been enrolled as an Associate because of lack of the experience qualifications required by the examination rules effective prior to 1941, will be enrolled as an Associate upon passing the current Associateship Examination Part IV.

(c) An Associate who has passed no part of the Fellowship Examination under the Syllabus effective prior to 1941 is required, in order to qualify for admission as a fellow, to pass the current Associateship Examination Part IV and Fellowship Examination Parts I-IV.

(d) A candidate who has passed one or more parts of the Associateship or Fellowship Examinations under the Syllabus effective prior to 1948 will receive credit for the corresponding

parts of the new Syllabus in accordance with the following table:

<i>Parts Passed Under Old Syllabus (Effective Prior to 1948)</i>	<i>Parts Credited Under New Syllabus (Effective in 1948)</i>
Associateship, Part I	Associateship, Part I - Section 2
“ “ II	“ “ II
“ “ III	“ “ I - Section 1
“ “ IV	“ “ III
“ “ V	“ “ IV
Fellowship, Part I	Fellowship, Part I
“ “ II	“ Parts III & IV - Section 15
“ “ III	“ Parts II & IV - Section 16

Partial examinations will be given to those students requiring same in accordance with the foregoing credits.

#### **5. Alternative to Passing of Fellowship Parts III and IV.**

As an alternative to the passing of Parts III and IV of the Fellowship Examination, a candidate may elect to present an original thesis on an approved subject relating to casualty or social insurance. Such thesis must show evidence of ability for original research and the solution of advanced problems in casualty insurance comparable with that required to pass Parts III and IV of the Fellowship Examination, and shall not consist solely of data of an historical nature. Candidates electing this alternative should communicate with the Secretary-Treasurer and obtain through him approval by the Examination Committee of the subject of the thesis. In communicating with the Secretary-Treasurer, the candidate should state, in addition to the subject of the thesis, the main divisions of the subject and general method of treatment, the approximate number of words and the approximate proportion to be devoted to data of an historical nature. All these must be in the hands of the Secretary-Treasurer before the second Tuesday in May of the year in which they are to be considered. No examination fee will be required in connection with the presentation of a thesis. All theses submitted are, if accepted, to be the property of the Society and may, with the approval of the Council, be printed in the *Proceedings*.

#### **6. Waiver of Examinations for Associate.**

The examinations for Associate will be waived under Article III of the Constitution in part or in whole only in case of those candidates who meet the following qualifications and requirements:

##### **1. PARTIAL WAIVER**

In case of a candidate who, for a period of at least two years preceding date of application, has been in responsible charge of the actuarial or statistical department of a casualty insurance organization and who has passed examinations of other recognized Actuarial Societies at least equivalent to Parts I, II and III of the

Associateship examinations of this Society, the passing of such parts of the Associateship examinations of this Society will be waived upon approval of the Examination Committee.

An organization whose operations or functions are limited to Accident and Health insurance, or Life Accident and Health insurance, shall not qualify as a casualty insurance organization.

## 2. FULL WAIVER

(a) The candidate shall be at least thirty-five years of age.

(b) The candidate shall have at least ten years' experience in the casualty actuarial or statistical work or in a phase of casualty insurance which requires a working knowledge of actuarial or statistical procedure or in the teaching of casualty insurance principles in colleges or universities. Experience limited exclusively to the field of accident and health insurance shall not be admissible.

(c) For the two years preceding date of application, the candidate shall have been in responsible charge of the actuarial or statistical department of a casualty insurance organization or shall have occupied an executive position in connection with the phase of casualty work in which he is engaged, or, if engaged in teaching, shall have attained the status of a professor.

(d) The candidate shall have submitted a thesis approved by the Committee on Papers. Such thesis must show evidence of original research and knowledge of casualty insurance and shall not consist of data of an historical nature.

Candidates electing this alternative should communicate with the Secretary-Treasurer and obtain through him approval by the Committee on Papers of the subject of the thesis. In communicating with the Secretary-Treasurer, the candidate should state, in addition to the subject of the thesis, the main divisions of the subject and general method of treatment, the approximate number of words and the approximate proportion to be devoted to data of an historical nature.

## LIBRARY

The Society's library contains all of the references listed in the Recommendations for Study, including the books noted as being out of print with the exception of certain periodicals and publications subject to periodical revision. It also contains numerous other works on casualty actuarial matters. Registered students may have access to the library by receiving from the Society's Secretary-Treasurer the necessary credentials. Books may be withdrawn from the library for a period of two weeks upon payment of a small service fee and necessary postage.

The library is in the immediate charge of Miss Mabel B. Swerig, Librarian of the Insurance Society of New York, 107 William Street, New York 7, N. Y.