

THE ASTIN BULLETIN

PUBLICATION OF THE ASTIN SECTION OF THE
PERMANENT COMMITTEE FOR
INTERNATIONAL ACTUARIAL CONGRESSES

VOL I, PART I



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Secretary and Editor R E BEARD, 252 High Holborn, London
W C I, England

INTRODUCTION BY CHAIRMAN OF ASTIN

Copenhagen, December, 1958

On behalf of the Committee of ASTIN I am very happy to be privileged to express a hearty welcome to readers of this first bulletin.

The aims of the ASTIN section of the Permanent Committee for International Actuarial Congresses, as expressed in the rules, are the promotion of actuarial studies in general insurance.

There is no doubt that events of recent years have demonstrated an increasing need for international contact in these fields. Technical actuarial questions are much the same in the various parts of the world, but with only a few actuaries engaged in the business of general insurance, contacts have necessarily been very limited. The establishment of a means for regular exchange of ideas on an international basis will, I sincerely hope, provide opportunities for stimulation in our researches in the years to come.

The success of the young ASTIN section cannot, of course, depend solely on the activity of its committee, although each of us appointed in New York will be doing his best to further the aims of the section. An editorial committee comprising renowned colleagues from various countries will help our editor in his work, but to ensure a full measure of success the initiative and collaboration of each individual member is necessary.

The early years when the plans for our future work are being evolved will, of necessity, be difficult and any suggestions from our members will be carefully considered by the committee. In particular we shall be greatly helped if members will let us know of any particular activity in which they are interested or engaged by completing the form enclosed with the bulletin.

A first essential in promoting collaboration is to know and understand each other. Views can be exchanged through the official channel of the ASTIN bulletin or directly between members. Inevitably language difficulties will complicate the proper understanding of the background of each others problems and it will clearly be of advantage to convey ideas in one of the official

languages of the International Actuarial Congresses. The use of either French or English would appear to minimise these difficulties for the majority of members.

It is my sincere hope that the interchange of ideas will result in the establishment of many friendly relationships, thus promoting not only our own specialised studies but also the understanding and friendship between nations.

PAUL JOHANSEN

EDITORIAL NOTE

252, High Holborn, London, W.C.1.

December 1958

The International Congress of Actuaries held in New York in October 1957 was the setting for the culmination of efforts extending over a number of years by a group of actuaries to set up an organisation representative of their particular interests in non-life insurance. Apart from the making of arrangements for periodical meetings of members, one of the aims of the founders has been the establishment of a journal and this first part of the *ASTIN Bulletin* marks the achievement of this aim.

The early parts will largely cover the work of *ASTIN* members during the International Congress of Actuaries in New York. As befits a new organisation, the proceedings of the inaugural meeting have been reported in full; the reports and papers presented at the *ASTIN* meetings show the wide scope of the subjects for which the pages of the *ASTIN Bulletin* are available. The intention is to provide new work, reviews of new work, summaries and surveys of existing work, and it is hoped that members will avail themselves of the *Bulletin* to put forward suggestions for studies and information on special subjects.

The report of the inaugural meeting of *ASTIN* on 16th October 1957 is given in the following pages. Following this a committee meeting was held at which appointments were made as follows:

Chairman	Mr. P. Johansen
Vice Chairman	Mr. F. S. Perryman
Editor	Mr. E. Franckx
Treasurer	Mr. B. Monic
Secretary	Mr. R. E. Beard

The other members being Sir George Maddex and Mr. C. Philipson.

At a committee meeting held on 27th September 1958 it was decided, in view of the heavy commitments falling on Mr. Franckx

in connection with the 16th Congress to be held in Brussels, that the editorial work should be undertaken for the time being by the Secretary. All communications should therefore be sent to Mr. R. E. Beard, 252, High Holborn, London, W.C.1.

The Editorial Committee consists of the following:

Messrs. H. Ammeter
B. de Finetti
P. Depoid
J. Engelfriet
L. Longley-Cook
O. Segerdahl

INAUGURAL MEETING OF ASTIN

Wednesday Afternoon Session

October 16, 1957

A special meeting of the ASTIN Committee convened at two-thirty p.m., in Parlour C of the Hotel Commodore, New York, Mr. N. E. Masterson presiding, 46 persons attending.

CHAIRMAN MASTERSON: It is now exactly two-thirty p.m. so we will begin the meeting.

I am starting the meeting as President of the Casualty Actuarial Society, an organization similar to the organization under consideration today. One of the most interesting parts of the work of the Casualty Actuarial Society was last evening where I think you had a very enjoyable time with us.¹

I want now on behalf of the casualty actuaries in the United States and Canada, to welcome officially here this group interested in the ASTIN organisation. Now, at this time, for the benefit of my United States and Canadian colleagues, I might explain exactly what these mysterious letters or initials are. ASTIN translated letter by letter, as we do some of our government agencies, stands for Actuarial Studies in Non-Life Insurance. In other words, the significant category in ASTIN is "non-life insurance", which corresponds very much to the present scope of the Casualty Actuarial Society, embracing casualty, fire, accident and sickness, all forms of insurance except life.

Now, in order to formally launch an important worldwide organization like ASTIN, we have to get started some way. I have the privilege—as head of the United States Society—to do so at this time. Previously, there were certain official actions taken by the International Congress in that one member of the Permanent Committee is designated as the ASTIN member of that board. That gentleman will take over this meeting from me in a few seconds as the official representative of the International Congress. He is

¹ Reception for the ASTIN members by the President and Council of the Casualty Actuarial Society at the Offices of the Royal Insurance Co. Ltd.

Sir George Maddex, and his position in Great Britain is the British Government's actuary. He is also a Knight of the British Empire. As the officially designated representative of the International Congress, I turn this meeting over to Sir George Maddex to act as the organizer or launching chairman of ASTIN. Sir George!
(Applause)

SIR GEORGE MADDEX: I hope we may take it, gentlemen, that you all have a copy of the letter issued by Mr. Franckx on the 18th of September.¹ I must say, it gives me great pleasure in the sense of undeserved honour to be asked to assist at the launching of the group. I take it as a historic day in the development of the Permanent Committee for Actuarial Congresses and the beginning of further extensions and developments.

The first step on the agenda which you have received is to receive a report of the provisional committee which over the past few years has, not without pain, drafted the rules and crystallized the ideas and methods of action of the ASTIN group. May I, therefore, ask Mr. Franckx to present a report of the ASTIN provisional committee.

(Mr. E. Franckx read his report)² (Applause)

SIR GEORGE MADDEX: You have heard Mr. Franckx' report. Is there any general desire that we should have it resumed in English? If so, I would ask Dr. Johansen to give a brief resumé.

CHAIRMAN MASTERSON: I think a summary in English by Mr. Johansen would be helpful.

MR. P. JOHANSEN: My friends, Mr. Franckx has told you a little about the work that has been done by the committee since the last Congress in Madrid. We have heard about the discussions which have taken place between that committee and the bureau of the Permanent Committee and Mr. Franckx expressed his warm thanks toward the chairman of the permanent committee.

Further, Mr. Franckx mentioned the draft rules that had been submitted to the various actuarial societies for discussion. As no objections have been made, these rules have been approved by the Board of Directors of that committee.

¹ Largely contained in Mr. Franckx's report.

² Reported in full later (p. 15).

Further, Mr. Franckx mentioned that a number of companies and insurance institutions all over the world have contributed to the secretarial expenses of the first years. He mentioned the names of those companies and institutions.

Mr. Franckx ended by thanking the members, or the future members, of our ASTIN group for the support that they have always so willingly given the members of the appointed committee during their work these years. He ended by expressing our urgent hopes for a fertile good future.

May I just here use the opportunity of standing before you to say to my friend, Franckx, a hearty personal thanks for the huge work he has given these things. I know that he is deeply personally interested in these problems.

(Applause)

SIR GEORGE MADDEX: Thank you very much.

With the presentation of that report, I think the work of the provisional committee ends. It is perhaps for this meeting of members and persons interested in ASTIN to accept the report, I am sure, with gratification and with a sense of profound thanks to the four members of the provisional committee for the enormous amount of work they have put into this the last year or two.

We come then to the dissolution of the provisional committee. That committee, of course, was set up at the instance of the Council of the Permanent Committee. I think all we can do here is to notify the Council in due course that the provisional committee has done its work and, with the foundation of the group, has been dissolved.

Before we go on to the next point, does anybody wish to raise any question on the report?

Very well. I think then we should now take the rules for the ASTIN group which, as you have been told, have gone before the Council of the Permanent Committee and been approved. May I take these rules as read or would anybody wish them to be read to the meeting? I think we can do nothing but accept them unless anybody interested in ASTIN feels that the interests of particular groups or the importance of any particular aspect of ASTIN has not been recognized in the rules. If not, then, I think we may report to the Council of the Permanent Committee that this

meeting accepts without question the rules proposed for the Constitution of ASTIN.¹

The provisional committee, having been dissolved under the rules, the first step is to set up a new, and as Mr. Franckx will call it, a permanent committee to manage the business of the group. The rules say that the committee is to be elected from among the ordinary members by written vote with the exception of one or two to be appointed by the Permanent Committee. At the moment, as I see it, I am the only member of this new committee (laughter).—Well, it is obviously not practicable for this meeting to attempt to appoint a committee. Therefore, those concerned with the organization of the group have turned their minds to the subject, and I think that Mr. Masterson would wish to make a proposal to the meeting.

CHAIRMAN MASTERSON: If this were an American mutual insurance company or a church—I'd better say a Presbyterian Church, I know something about that one,— I would probably be designated as a chairman of the nominating committee. It was necessary in some way at this meeting, to select a board of seven members that would operate during the next three years or until the next meeting of the Congress in Brussels. So, as chairman of the nominating committee I have this slate to propose to this group in lieu of any worldwide election. Of course, on this board of seven, Sir George Maddex is a member of the Permanent Committee so designated on our Board. He is automatically a member of the new Board of ASTIN.

That, then, would require an additional membership of six individuals. It was considered most desirable that four of the remaining six be the four men who were designated by the Permanent Committee and who have prepared the report which you heard from Mr. Franckx. Therefore, I am proposing as members of the Board the following four from the former temporary preparation board: Mr. Franckx of Belgium, who prepared the report. I think you all know him. Mr. Monic of Great Britain. Is he here? I would like to have him stand so that the others can see him. Mr. Beard of Great Britain, if he will stand so we will know who he is. Mr. Johansen of Denmark. He was our translator.

¹ English and French versions of ASTIN rules appear on p. 18-21.

Then, in addition, the Nominating Committee has selected Mr. Philipson of Sweden. Will he stand up?

Then, to represent the United States and Canada as President of the Casualty Actuarial Society, I was asked to name a member to represent the countries now covered by the Casualty Actuarial Society. I named Mr. Francis Perryman.

Therefore, Mr. Chairman, I would like to present the following six names for the new Board: Mr. Franckx of Belgium; Mr. Monic and Mr. Beard of Great Britain; Mr. Perryman of the United States; Mr. Philipson of Sweden; and Mr. Johansen of Denmark. I place those in nomination.

SIR GEORGE MADDEX: Well, gentlemen, you have heard those names. Possibly all of you know something about some of them, and that, of course, is as high as one could expect to put it at this stage. I don't think we can very usefully discuss those names or consider any alternatives. I would like, therefore, to put it to the meeting that the six gentlemen whose names have been given to you by Mr. Masterson be appointed the first committee of the ASTIN group.

Will all those in favour raise their hands. Is there anybody against? Then, I take it that the first committee is approved by this meeting. The next step for them will be to meet when convenient to elect from themselves, as provided in Rule 3, a chairman, secretary, treasurer and editor.

We could, of course, disband this meeting while they went into recess and elected those officers, but that doesn't seem necessary or the best way of getting on with the business, especially as it has been arranged that we shall have some addresses on the current situation in certain aspects of work with which ASTIN may concern itself. So, therefore, unless there is any other business relating to the organization, the setup of the ASTIN group, any questions on that which any of those present would like to raise, I would hand over the meeting again to Mr. Masterson to take the chair while the four gentlemen whose names are given in the letter of the 18th of September tell us more about the subject.

Before I do that, is there any observation or question which anybody wishes to make? Well, if I may say so, I think the foundation of the group has proceeded with no undue delay. Now, I

will observe no undue delay, but ask Mr. Masterson if he will take the chair for what might be called the first business meeting of the ASTIN group, although we are all provisional and potential members.

(Applause)

CHAIRMAN MASTERSEN: Thank you, Sir George Maddex.

The first informal speaker to speak before the whole group here before the seven have their meeting is Mr. Wilhelmsen from Norway. Would he come forward please and give a few remarks?

MR. L. WILHELMSEN: My dear colleagues, I wish to start in the same way as Mr. Franckx to regret that I speak very bad English, but contrary to Mr. Franckx, my French is even worse. Therefore, I prefer to speak English.

(Mr. Wilhelmsen read a paper.)¹ (Applause)

CHAIRMAN MASTERSON: Thank you Mr. Wilhelmsen.

Now, I have a report by Mr. Depoid. (Applause)

MR. P. DEPOID: I tried to make a general survey of the different fields. Further, I would like to show the progress of the work of the problems that interest us. But, it would be necessary to consider all the various works of the various countries, and that would be too big a project.

(Mr. Depoid read a paper)² (Applause)

CHAIRMAN MASTERSON: Thank you, Mr. Depoid.

Mr. de Finetti is going to discuss a few remarks from his country. You might be interested to hear that Mr. de Finetti after this meeting is going to the University of Chicago for a couple of months on a research project there.

(Mr. B. de Finetti read a report)³ (Applause)

CHAIRMAN MASTERSON: Thank you, Mr. de Finetti.

Our last report is the report from the Casualty Actuarial Society representative of the United States and Canada. This report ought to have been given by Mr. Longley Cook, but he is back home ill. The report from the Casualty Actuarial Society will be given by Francis Perryman.

¹ Reported in full later.

² Mr. Depoid's remarks have been incorporated in Mr. de Finetti's contribution.

³ To be reported in full later.

I might say while Francis is coming up here, that Francis and Longley Cook served on the permanent committee, representing the casualty side of the business in connection with this 15th Congress. Also, the Casualty Actuarial Society had a committee of its own to assist in the arrangements of the Casualty Society's program. The members of that committee were Longley Cook and two others who are here. I would like to have them stand. They are Joe Linder of New York and John Edwards of Toronto.

(Applause)

Now, Mr. Perryman, who was recently elected from the United States and Canada to the new Board, will you now present the story of the Casualty Actuarial Society?

(Mr. F. Perryman read a report)¹

CHAIRMAN MASTERSON: That completes the four reports that were scheduled. But, I would like to call on Paul Johansen of Denmark to give a few concluding remarks. He will make his remarks in English, but I am sure, if necessary, he could also do it in Danish, Swedish, Norwegian and German or French.

(Applause)

MR. P. JOHANSEN: I would like to add a few practical remarks to the papers already delivered today.

First, we hope that the papers presented today may be published somehow under the guidance of either this Congress or of ASTIN itself. So, we hope to have an opportunity of studying in full length the valuable papers that we have heard now.

Then, one point of the rules should be more or less agreed upon today. That is the question of money. Rule No. 6 runs that membership fees will be determined at the meeting of the members. Well, to avoid the situation that we cannot have any fees at our disposal before the next meeting, we would just like to ask the people present how they would regard an annual fee of 200 Belgian francs. That is about 28 shillings or \$ 4. That could not be too much, I hope. Mr. Franckx will add a few remarks to that, but before sitting down, I would like for my own sake to thank you very much for the appointment to the first ASTIN Board. I do not feel that we deserve this appointment as we have not proved ourselves worthy yet, but we hope that after the first period, you will find

¹ Reported in full later.

some valuable progress in our mutual work. I can tell you that for my sake, I will not sink down in the chair. In Denmark we have a rule that people on the Board of our Association must not stay on for more than a rather limited period. Even if I know that the same rule cannot over-all be used in international associations, I personally am just thinking of a single term.

But, I would like to say just one thing more. I think that a body of our size here could prove to be very valuable as a tool for international collaboration. A friend of mine once told me something about some large International Congresses. I would like to say that he didn't criticise the Actuarial Congresses, but still, he said that such a huge Congress was something like the family life of the elephants. You see, it takes place on a very high level. They blow the trumpet all the time, and the results are very late. (Laughter) I hope that we can find the means for some quicker, some more efficient work than work on that scale. I hope it will be a little more like the rabbits, maybe. (Laughter and applause)

CHAIRMAN MASTERSON: Mr. Franckx, can you add to that in connection with fees?

MR. FRANCKX: Well, the first thing I have to say is about the fee. I discussed the question with Mr. Boels who is the General Secretary of the Permanent Committee, and we think the following arrangement for the ASTIN section will operate like the general fee to the Permanent Committee. I will try to explain myself.

You pay your contribution to the Permanent Committee to your national representative. It will be just the same for ASTIN. You have to pay your general contribution plus your ASTIN contribution. That is the first thing.

The second thing is that I think we have had some very interesting papers, and it would be interesting to have discussion about them.

When I came to New York, I expected to be an ordinary member. Thus, for subject IV A, I am Co-Chairman with my friend Johansen. Consequently I am not able to speak about subject IV-A. I would like to make some remarks on subject IV-A, which is, in fact, ASTIN. I think it will be interesting as I don't have to speak on Friday, and I can say something about the ASTIN papers. I shall read this in French.

(Mr. Franckx read a statement.)¹ (Applause)

CHAIRMAN MASTERSON: It is now four-thirty p.m. or 16. 30. There is another short announcement by Paul Johansen. While you are making that announcement, Paul, will you just clarify for us again this matter of the ASTIN dues and the International Congress dues and so forth.

MR. JOHANSEN: The announcement that I was very sorry to forget a moment ago was that we have decided that tomorrow afternoon at this same place, same time, here in this room, at 2.30, p.m. a quite unofficial gathering or meeting could take place.²

We have only a few possibilities of speaking together, and we find it would be useful if those of us who are really interested in these matters could come together here and just exchange views and maybe also, quite unofficially, discuss a little the problems under discussion.

We might also discuss the future possibilities of ASTIN studies. We have talked about forming a kind of editorial board with members from various countries. Maybe we could also consider that point tomorrow.

Then, I would just like to say this about the membership fee: We have fixed it in Belgian francs so that it could be paid together with your fees to the Permanent Committee on the same bill for personal members.

CHAIRMAN MASTERSON: Mr. Beard has asked for just two minutes. Could you keep it within two minutes? Then, I want Mr. Perryman to make a few remarks.

MR. R. E. BEARD: Mr. Masterson, Sir George, on behalf of the British contingent, I would like to say a few words. There aren't many of use here, but I would like to say thank you very much for including me on the committee. I look forward to extending the activity of the actuarial field in my country.

I think language has been one of the difficulties that have been before us. I heard that Mr. Depoid has given us a list of the French contributions. In Mr. de Finetti's contribution, I have heard him refer to many others of the works which I have had to work through.

Two further things occurred to me during the remarks. Mr.

¹ As reported in the proceedings of the 15th Congress.

² Summary of Mr. Philipson's remarks reported later p. 32.

Wilhelmsen made the comment that fire, or shall we say, non-life insurance rates could be adjusted easily. I am sure our American and Canadian colleagues would be interested to hear that fire and windstorm rates could be so easily adjusted!

There was another point which I would like to mention. Cross-fertilization was mentioned in Mr. Longley Cook's comments. Those of you who have read the Congress papers for this morning's discussion will notice Mr. Ammeter's contribution on experience rating. In the London market, we do see quite a lot of reinsurances of retrospective rating in Workmen's Compensation business. I happen to know one of the leading underwriters concerned with this business and I am sure that if he could understand Mr. Ammeter's paper, the rating would be a little more precise. He has set up a criterion which is very valuable and, I believe, has written a generalization of the paper.

I must say, it is a very happy day for me because I think it was in 1946 that Paul and I had dinner in London. We talked about problems of fire insurance, and we both said it will be nice when we can sit down officially with other actuaries and discuss these problems.

Thank you. (Applause)

CHAIRMAN MASTERSON: Is Mr. Perryman here?

MR. PERRYMAN: I have just a short announcement to make. The official programme of the 15th Congress provides for visits to life companies. If any of you are interested in seeing the electronic installation of the Royal Insurance Company, we will be very happy to see you at three o'clock on Friday of this week.

If you want to come, it would be helpful if you give Mr. Schloss of our company, who is in the back, your name. We have a 705 equipment there which has just been put in.

CHAIRMAN MASTERSON: Before we close, what were the hours, again, for another informal meeting?

MR. JOHANSEN: The same place, same time.

CHAIRMAN MASTERSON: Thursday, 14.30, same place.

MR. FRANCKX: I want to express thanks to Sir George Maddex and Mr. Masterson. (Applause)

CHAIRMAN MASTERSON: This merely is a recess, then, until tomorrow at 2.30 p.m. right here.

(The meeting ended at four forty-five o'clock)

ALLOCUTION DE M. FRANCKX AU NOM DU COMITÉ PROVISOIRE

Mr. Chairman, Mesdames et Messieurs,

C'est pour nous une très grande joie d'avoir, ici à New-York, à rendre compte aux membres d'ASTIN des résultats que nous avons obtenus depuis notre première réunion non officielle, lors du XIVe Congrès International à Madrid.

Nous vous rappellons que lors de cette séance privée, les membres présents ont exprimé le voeu que notre organisation puisse se constituer et s'intégrer comme partie véritable dans le sein du Comité Permanent des Congrès d'Actuaires.

A cette fin, un comité provisoire composé de Beard, Franckx, Johansen, Monic a été chargé de rechercher avec l'accord du Comité Permanent une solution qui permettrait, dans le cadre de ce Comité, de favoriser l'étude des problèmes de l'assurance des risques divers.

Au cours de ces trois années, de multiples contacts ont eu lieu à Bruxelles, à Londres et lors de réunions anniversaires à Zurich et à Edimbourg. Nous sommes vraiment heureux de pouvoir dire que de toute part on nous a encouragé dans nos efforts et que de tous les côtés nous avons été entendus avec intérêt et surtout avec le sincère désir d'arriver à une solution constructive.

Nous amenions une formule de travail et d'organisation nouvelle, mais il est bien vite apparu, que la création d'ASTIN comme section autonome devait entraîner une modification des statuts du Comité Permanent.

Des propositions en ce sens ont été introduites par Monsieur Marchand, Président de l'Association des Actuaires Suisses, et la section d'ASTIN ne pourrait exprimer assez sa gratitude à Monsieur Marchand, d'avoir catalysé par son intervention la formation d'ASTIN.

Ces propositions ont été admises par le Comité Directeur du Comité Permanent et seront soumises à l'Assemblée ici même à New York vendredi.

Simultanément le Comité d'ASTIN a fait un projet de règlement

qui fut proposé au Président et au Secrétaire Général du Comité Permanent et soumis pour examen aux différentes organisations nationales.

Après rectifications ce règlement a été mis à l'ordre du jour de la séance du Comité Directeur qui a eu lieu ici même hier matin. Après approbation et conformément aux modifications des nouveaux statuts du Comité Permanent, nous avons eu la joie de voir Sir Georges Maddex accepter d'être auprès d'ASTIN le premier délégué du Comité. Sous son patronage et sa haute autorité, nous sommes convaincus que la nouvelle section d'ASTIN établira dès ses débuts ses traditions dans une ligne qui sera un exemple pour d'autres sections à créer. Nous pensons que c'est ainsi que nous pourrons au mieux exprimer notre gratitude à Sir George.

Sous réserve de l'approbation du règlement du Comité Permanent, rien ne s'oppose à la création officielle d'ASTIN et c'est là l'objet de notre réunion d'aujourd'hui.

Mais avant de terminer permettez nous de remercier tous ceux qui ont effectivement contribué à la réalisation de ce grand jour.

Avant tous nos remerciements les plus chaleureux s'élèvent à MM. Théate, président du Comité Permanent et Boels, secrétaire général, qui tout au long de nos pourparlers ont oeuvrés et manoeuvrés pour éviter les embûches dressées devant nous, avec le sincère désir de nous aider dans l'accomplissement de notre but.

Nous nous devons de signaler le concours chaleureux qui nous a été accordé par les actuaire américains. Devons nous rappeler que Mr. Linton, président du comité organisateur de ce XVe congrès, nous a proposé de choisir le sujet IVA, qu'il nous a prêté tout le concours de son organisation et que tout fut mis en oeuvre pour qu'aujourd'hui dans les locaux de Commodore la séance d'ASTIN puisse avoir lieu. Nous avons aussi eu ce merveilleux appui de la Casualty Actuarial Society d'Amérique, qui sur le plan américain précède depuis longtemps l'action d'ASTIN et nous accorde l'appui de toute son expérience. Nous soulignons ce geste de la Casualty Actuarial Society qui à l'occasion de notre formation a eu cette merveilleuse idée d'inviter à une très belle party tous ceux qui s'intéressent à nos efforts. Cela nous a permis de mieux nous connaître et de mieux nous comprendre et de sentir que la

bonne volonté est partout, tant dans le vieux monde que de ce côté-ci de l'Atlantique.

Nous ne pourrions cacher que certaines compagnies ont voulu donner un appui financier dès la constitution d'ASTIN et nous ont promis une contribution dont la valeur s'élève à \$ 2.200 et qu'un membre d'ASTIN a offert l'impression gratuite des travaux d'ASTIN pendant la 1^e année de son existence.

Nous avons à excuser à cette réunion M. le Prof. Cantelli, président des actuaires Italiens, M. de Mori de Rome et M. Neuhaus de Zurich qui n'ont pu se joindre à nous.

Enfin au nom du Comité Provisoire nous remercions tous les membres de leurs encouragements. Aujourd'hui le comité peut considérer sa mission comme terminée; le but assigné est atteint.

Nous devons nous tourner vers l'avenir et cet avenir, chers amis, est entre vos mains. ASTIN sera ce que nous tous et surtout les jeunes vous en ferez. Nous avons créé un instrument d'action, pour servir, au sens le plus large du mot: servir, pour aider les hommes à surmonter les hasards du sort et du malheur, servir pour contribuer à l'avancement de la science pour promouvoir la recherche scientifique, pour unir nos efforts au service de tous.

C'est bien un idéal, mais les plus belles pensées qui ne se traduisent pas sur le plan des réalisations pratiques sont des fleurs sans fruit et ASTIN aura son importance dans la mesure où vous tous affirmez par vos actions, par vos travaux que son existence est pleinement justifiée.

Il nous reste à souhaiter à tous bonne chance et bon travail.

RULES FOR THE ASTIN SECTION OF THE PERMANENT COMMITTEE

1. The section for actuarial studies in non-life insurance (ASTIN), formed according to the rules of the Permanent Committee, has as its object the promotion of actuarial research in general insurance. The ASTIN section will establish contact between actuaries, groups of actuaries and other suitably qualified persons interested in that field.
2. There will be three classes of members, as follows:
Ordinary Members, being members of the Permanent Committee who indicate their desire to join the section and register accordingly.
Special Members, being persons of qualifications who may be elected to membership of the section on the recommendation of at least two ordinary members.
Corporate Members, being institutions of any appropriate type who are interested in the affairs of ASTIN and contribute towards its expenses and who may be elected to membership of the section on the recommendation of at least two ordinary members.
Any member may resign at any time by giving due notice in writing.
3. The affairs of the section shall be managed by a committee of not more than seven members. One or two of them shall be appointed by the Permanent Committee. The remaining members shall be elected by and from amongst the ordinary members by written vote every three years. The Committee shall appoint from among themselves a Chairman, a Secretary, a Treasurer and an Editor.
4. The section will, from time to time, publish papers on topics related to its objects and also publish a bulletin containing notes of general interest to members.
5. The section will hold conferences as determined by its committee such conferences to be normally held not less frequently than once every three years. The conferences will be open to ordinary and special members of the section. Should the conference be

held concurrently with an International Actuarial Congress, the conference will be open to all members of that Congress. The Committee may invite other suitably qualified persons to take part in such conferences.

6. Membership fees will be determined at the conferences of members by a simple majority of the ordinary members present.
7. Change of rules shall be determined by written vote on a simple majority of ordinary members. Recommendations for alterations to the rules or for election of committee members shall reach the Secretary at least three months before the date of voting and the Secretary shall communicate all such recommendations to all members at least one month before the voting. No change of rules shall take effect until approval has been given by the Permanent Committee.

STATUTS POUR LA SECTION ASTIN DU COMITÉ PERMANENT

1. La section d'études actuarielles dans l'assurance de Risques non viagers (ASTIN) créée en conformité avec les Statuts du Comité Permanent, a comme objet la promotion de la recherche actuarielle dans l'assurance des Risques Divers.
La section ASTIN établira le contact entre actuaires, groupes d'actuaires et autres personnes de qualification requise, intéressées à ce domaine.
2. Il y aura trois classes de membres, soit:
Les membres ordinaires, qui étant membres du Comité Permanent, expriment le désir de se joindre à la section et sont enregistrés en conséquence;
Les membres spéciaux, c'est-à-dire les personnes de qualification requise qui peuvent être élues membres de la section sur la recommandation d'au moins deux membres ordinaires;
Les membres corporatifs, c'est-à-dire les institutions de tout genre requis qui s'intéressent aux affaires de ASTIN et contribuent à ses dépenses, à condition d'être élus membres de la section sur la recommandation d'au moins deux membres ordinaires.
Un membre peut démissionner n'importe quand, en prévenant dûment par écrit.
3. Les affaires de la section seront administrées par un comité de sept membres maximum. Un ou deux de ces membres seront nommés par le Comité Permanent. Les autres membres seront élus par et parmi les membres ordinaires, par vote écrit tous les trois ans. Le comité nommera un président, un secrétaire, un trésorier et un rédacteur dans son sein.
4. La section publiera de temps à autre, des documents sur des sujets en relation avec son objet et publiera également un bulletin contenant des notes d'un intérêt général pour les membres.
5. La section se réunira en conférences selon les décisions de son Comité, de telles conférences devant normalement avoir lieu au moins une fois tous les trois ans. Les conférences seront ouvertes

aux membres ordinaires et spéciaux de la section. Si la conférence a lieu concurremment avec un Congrès International d'Actuaires, elle sera ouverte à tous les membres de ce congrès. Le Comité peut inviter d'autres personnes de qualification requise à participer à de telles conférences.

6. Les cotisations dues par les membres seront fixées, au cours des conférences à la simple majorité des membres ordinaires présents.
7. Tout changement de règlement sera déterminé par vote écrit à la simple majorité des membres ordinaires. Les recommandations en vue de modifier le règlement ou en vue de l'élection des membres du Comité seront envoyées au Secrétaire au moins trois mois avant la date du vote, et le Secrétaire communiquera toutes les recommandations de cette espèce aux membres, au moins un mois avant le vote. Un changement de statuts ne deviendra effectif que lorsque le Comité Permanent aura donné son approbation.

ACTUARIAL ACTIVITY IN GENERAL INSURANCE
IN THE NORTHERN COUNTRIES OF EUROPE

L. WILHELMSSEN,
Oslo

Read to ASTIN, Wednesday, 16th Oct. 1957

1. *Introduction—The demand for Actuaries in General Insurance*

Although actuaries have been connected with life insurance business for more than 100 years, it is only more recently that actuarial activities in the non-life branches have taken place.

The problem of calculating level premiums for the steadily increasing risk in life insurance immediately calls for mathematical ability. The need for mathematically trained specialists is not so easily seen when the problem is to calculate premium rates for fire and casualty insurances. The premium rates in this field have to a great extent been fixed by persons with none or very little knowledge in mathematics and mathematical statistics. When the market conditions allow for considerable margins this arrangement works out very well. The statistical investigation needed later on for controlling the premium rates is not very complicated, and the premium rates can if necessary be changed on short notice. A mistake made in the premium stipulation, will generally not have a lasting effect. In life insurance on the other hand, the contracts often stretch over many years and a mistake in the premium stipulation cannot easily be corrected. These circumstances explain the reason why actuaries have been more often engaged in life insurance than in the fire and casualty branches.

But a closer study shows that from a mathematical point of view, the proper fixing of premium rates is often more complicated in the fire and casualty branches than in life. In the fire and casualty field a steady changing of market conditions seems to take place. The competition grows keener and keener, and the margins are cut down. Sooner or later we reach a point where it is of vital importance to know as exactly as possible where we stand. This

means that we have to study the risk premium, the security loading and the expense loading separately, and to estimate these quantities with the highest efficiency.

Also in the reinsurance field there are many questions calling for knowledge of mathematics and mathematical statistics. Among these questions, the retention problem should especially be mentioned. In earlier days when margins on premium and commission rates were larger, it was of no great importance how the retention limits in the surplus treaties were fixed, if only they were low enough. But when the margins are low and the possibility of getting reciprocity of the same quality as the reinsurance given away is small, it grows more and more important to fix retention limits which are not too low. To do this, it is necessary to have a clear definition of the aim of reinsurance. This definition must be translated into a mathematical language, to be the starting point for theoretical investigations.

During recent years there has been a tendency towards an increased use of non-proportional reinsurance forms, such as excess of loss, stop loss etc. The calculation of premium for covers such as these also requires a certain amount of mathematical knowledge.

There are, as we have seen, problems of vital importance for the fire and casualty insurance branches which call for actuarial knowledge, and it can be expected that the number of actuaries working in this field will increase in years to come. Many of the problems with which these actuaries will deal are new problems for which no ready made solutions exist. But the problems are the same or very similar from one country to the other, and a good deal of work could therefore be saved by collaboration between actuaries from different countries. This is the way in which I have seen the background for the establishment of the ASTIN group of actuaries. The ASTIN collaboration group will make the results obtained by actuaries in one country available for actuaries in other countries. ASTIN will also instil in their membership the desire for further research above and beyond the normal daily problems. Results of such studies and research will elevate our profession to a high scientific level.

2. The Education of Actuaries

I am going to give you some information about the actuarial activity in general insurance in the northern countries of Europe, that means in Denmark, Finland, Norway and Sweden.

The education of actuaries is very similar in Denmark and Norway and the systems adopted in these two countries are different from the systems which are used in Finland and Sweden. In Denmark and Norway there is a special degree for actuaries at the universities. The actuarial students have to follow a course of study and to pass various examinations which are set up for them. In both these countries the education of actuaries consists of studies in pure mathematics, insurance mathematics and mathematical statistics, and in economics. The students very often have jobs in insurance companies during the time of their study, and therefore need considerable time in order to finish their studies. If a student were to use all of his available time in pursuit of these studies it has been estimated that he would require six years. In Sweden the education of actuaries also takes place at the university but there are no special degrees for the actuaries. The young students wishing to become actuaries can therefore to a certain extent choose between different courses. To be approved as chief actuaries in life insurance companies the students have in practice to pass an examination in mathematics and in insurance mathematics with mathematical statistics. In Finland the students study mathematics at the university, but there are no courses in insurance mathematics at the university. The persons who wish to be approved as chief actuaries in life insurance companies have to pass certain examinations to prove their ability in insurance mathematics and mathematical statistics. But these examinations do not take place at the university. The requirements which are necessary to pass these examinations are stipulated by the ministry of social affairs and the examination takes place under the supervision of this ministry.

As you will see from what I have said, the education of actuaries in all the northern countries in Europe aims at educating actuaries for the life insurance business. But as the actuaries have to go through rather extensive courses in mathematical statistics the same education is also well suited for actuaries in general insurance.

3. *Actuarial activities within Non-life Insurance Companies*

Many companies in the Scandinavian countries and in Finland show an increasing interest in establishing a more scientific base for the premium calculations. These companies employ actuaries or other persons with knowledge in mathematical statistics. Especially in Sweden, a comparatively large number of actuaries are employed in general insurance companies, or in organisations closely connected with the companies. Many of these actuaries are busily engaged in research work, and our profession in Sweden stands on a very high scientific level. This is also proved by the many papers delivered by Swedish authors on Subject IV A at this congress.

The tariff organisations for automobile insurance employ actuaries in all four countries, and this is also the case with some of the tariff organisations for the other branches.

The collection and preparation of joint statistics from material from tariff companies, and other groups of companies, are supervised by actuaries in all four countries.

4. *Collaboration between Actuaries employed in General Insurance*

Different kinds of collaboration exist between actuaries employed in general insurance in the northern countries of Europe. The most important background for the collaboration is perhaps the personal contact that exists independent of the national borders. These personal contacts always make it easy for an actuary to collect information which he wants concerning conditions in other companies, in his own country, and in other Scandinavian countries. Through these contacts personal friendships between actuaries from different countries have grown, and as you know, such close relationships always make it easier to exchange views and to discuss problems of joint interest.

There also exist two organisations aiming at a collaboration between actuaries in the fire and casualty branches, and these two organisations are called the N.T.A. and the C.N.Ö.B.

The N.T.A. is a collaboration group of actuaries engaged with tariff companies and tariff organisations in our countries.

The main activity of this group consists of meetings where problems of joint interest are discussed. These meetings always

take place outside the cities and last for two or three days. The number of members attending these meetings has been between fifteen and twenty. Up to the present three such meetings have taken place and their success was due to the fact that the small number attending permitted everyone to take an active part in the discussions.

Another organisation aiming at joint actuarial activity in the northern countries in Europe, is the C.N.Ö.B. which means the northern central for fire insurance statistics from mutual companies. The activity of this organisation is managed by a board consisting of four members, one from each country. The aim of the organisation is to collect statistical material from all of the four countries and to work out joint statistics. The organisation regularly each year prints a paper giving a general view of the fire insurance conditions during the last year in each of the four countries. In addition the publication contains statistics about all of the large fires that have taken place in the northern countries during the last year. In addition to this regular publication the organisation from time to time also prints reports on special investigations which have been undertaken.

5. *Actuarial problems from General Insurance in the Scandinavian Actuarial Journal and in the Actuarial Societies*

In all the four countries, papers dealing with actuarial problems from general insurance are from time to time presented in the actuarial societies. The Scandinavian actuarial journal also prints papers dealing with such problems.

The problems which actuaries in our countries have treated in the last years are distributed over a wide range of topics. I shall mention some of these topics, but it is not possible to mention the names of the actuaries who dealt with each topic and the conclusions reached by all of them.

First I will mention the collective theory of risk which is of Scandinavian origin and to the development of which many actuaries from our countries have contributed. As is very often the case with theories from the economic field the collective theory of risk was originally based on suppositions which do not always occur in real life, in order to avoid some of the difficulties which would

otherwise arise. The later work has to a great extent been directed towards the treatment of the theory in cases where suppositions made more closely reproduce real life. This has been a wide field for further research and the conclusions reached have certainly made the application of the collective theory of risk easier. At this stage it can certainly be said that the theory is a tool of great practical importance for fixing the companies' retention limits.

A few of the more important questions dealt with in connection with the premiums calculation are as follows:—

The risk premium in fire insurance as a function of the dimensions of the house.

The risk premium in traffic insurance as a product of different factors, each of which is dependent on a smaller number of moments than is the risk premium.

How to judge the largest claims statistically, and how to draw conclusions from such rare events by the stipulation of premiums.

The use of comprehensive policies and the premium stipulation for such policies.

The premium for fire insurance as a function of the distance to the neighbouring risk.

The premium stipulation for crop insurance.

6. *Astin*

The establishment of the ASTIN group of actuaries and the organisation of this group as a section of the Permanent Committee of the International Congress of Actuaries, has been met with much enthusiasm in the northern countries in Europe. We really hope that it will be of great value for our profession, but very much depends upon the activity of the members and their willingness to publish papers and to take an active part in the discussions.

Further, as a means of contact between actuaries from different countries ASTIN can be very useful. It is an idea worth considering that actuaries who are interested in special problems should register this with ASTIN and that ASTIN should put them in contact with colleagues interested in the same kind of problems. This would save work, create useful contacts and establish new friendships as well.

THE CASUALTY ACTUARIAL SOCIETY AND ACTUARIAL
STUDIES IN DEVELOPMENT OF NON-LIFE INSURANCE
IN NORTH AMERICA

L. H. LONGLEY-COOK,
Philadelphia

*Read in his absence by Mr. F. S. Perryman to ASTIN
Wednesday, 16th October 1957*

Thank you, Mr. Masterson, Sir George and friends. Mr. Masterson told you that Mr. Longley-Cook was going to give this report originally. Since he can't, he has turned it over to me, and I shall deliver it practically the way he has written it.

The profession of actuary originating in the need for a scientific approach to the problems, of early life insurance companies, has broadened its scope over the years, and many actuaries now provide valuable contributions to the scientific study of problems in insurance, commerce and industry which are completely unrelated to life insurance. Because a large majority of actuaries are concerned, however, with problems of life insurance and pension plans, those outside these fields have felt the need for an association which is concerned with their special interests.

I feel most honoured to take part in the birth of ASTIN, an association for the study of insurance problems outside of the life insurance field. It was most wise that ASTIN has been formed as a section of the International Congress and not as an independent organization because, although our problems may be different, we will gain much in our mutual association.

A specialist should not, in his devotion to his particular line of study, lose touch with the broader and more general developments of science. Cross-fertilization of ideas can, on many occasions, prove invaluable. It was over 48 years ago that Mr. Stanley Otis and others suggested that a society of actuaries and statisticians of liability companies be formed. Some five years later, the Casualty Actuarial and Statistical Society of America—later to be known

by the shorter title of Casualty Actuarial Society—was inaugurated.

One of the first papers in the proceedings of the Society was entitled "How extensive a payroll exposure is necessary to give a dependable pure premium?" That was for Workmen's Compensation Insurance. This, the problem of the creditability of insurance data, is one of the most fundamental problems for the non-life actuary.

The Casualty Actuarial Society proceeded almost at once to set up courses of study and examinations so that its members would have that broad knowledge which is so essential to the able solution up a particular problem. The Society has consistently followed this course of action, and the education work it continues to perform is as valuable today as it was in the early days.

In the first years, the problems, particularly the rate making and reserve questions relating to compensation and automobile insurance, were of predominate importance. But, as time has gone on, the Society has extended its interest to all classes of casualty insurance, and in recent years, to fire insurance.

I might interpolate here for the benefit of some of our friends from abroad. In those early days, life insurance companies in this case were divided by law into three classes: the life companies; the fire companies; and, the casualty companies. The Casualty Actuarial Society had its genesis in the casualty insurance field, but, in the last ten or a dozen years, laws have been relaxed so that non-life companies can write all classes of casualty insurance, and the Casualty Actuarial Society has extended itself to these problems or the fire field.

Continuing Mr. Longley Cook's remarks, it seems well to explain for the benefit of those of you who are unfamiliar with the practice of fire and casualty insurance in the United States of America that the industry, and particularly the rates of premium for insurance, are and have been for many years regulated by the state authorities to an extent completely unknown in most other countries. This regulation is rightly aimed at the protection of the public, and it is directed to see that insurance companies remain solvent and that premium rates are adequate, not excessive and not unfairly discriminatory.

Actuaries have had the burden of developing statistical inform-

ation and rating plans that meet these tests, and the statistical information available in the United States of America far exceeds the comparative statistics available elsewhere.

The Proceedings of the Casualty Actuarial Society provide a fund of information on all aspects of casualty insurance and the rating techniques of retrospective and experience rating are a monument of careful study and inventiveness. In this respect—this is Mr. Longley Cook—I can praise my colleagues because I have done no work in the casualty field because since I have departed from the life field, I have been more concerned with the problems of fire insurance. That was Mr. Longley Cook. My experience was different. I left the life field and went into the casualty business and later into the fire business.

Although the scope of the Society was originally limited to casualty insurance, the broadening of the interest of the members and the introduction of many forms of multiple line policies embracing both first and third party coverage and "all risk" insurance, led to the modification of the Constitution in 1950 to cover all actuarial and statistical problems in insurance other than life. Prior to this time, some work had been done in fire insurance, but, because much of this was done without interchange of ideas, which a Society provides, the development in this field had been comparatively slow.

I would like to say something of the Casualty Actuarial Society as it is today. The Society has approximately 330 members of whom 180 are Fellows and 150 Associates. It conducts an extensive system of examinations, one-half of which have to be passed before a candidate is admitted as an Associate. Two two-day meetings of the Society are held each year. The spring meeting is usually held in a small resort town, and the autumn meeting in a large city. These meetings provide an invaluable opportunity for the exchange of ideas and the presentation of papers.

I might emphasize this by saying that the membership of the Society is not confined to people working in companies, as I suppose the vast portion of the members are, but, there are a number of them in the independent actuarial consulting field and quite a growing number in the service of the various state governments that supervise and regulate insurance companies. Accordingly, the

Society forms a very welcome forum for the interchange of ideas on a professional basis between people who are dealing with the same problems from different angles. It may give you some idea of the activities of the Society if I mention the papers prepared for discussion in the year 1956.

In addition to two most stimulating addresses by our President, Mr. Masterson, we had three papers on Workmen's Compensation, one on automobile insurance and one on fire insurance. Some of you may feel as you glance through the 1956 volume of the Society's proceedings, which contain these papers, that they lack the scientific examination by mathematical study and original research which is shown in some of the papers shown by subject IV-A of this present Congress. This is because we are practical men, engaged in practical business. In many cases, the basic theoretical studies have already been made. However, we all realize that there is much fundamental research still to be accomplished; you can find numerous papers in our proceedings which are as concerned with fundamentals and which have the sort of mathematical approach found in those we shall be discussing this week.

It is difficult to say to what extent ASTIN can gain from the experience of the Casualty Actuarial Society, but it certainly can feel assured that the experience of the Casualty Actuarial Society has shown that a particular forum in which the particular problems of non-life insurance can be stated and discussed is going to help the work of all of us who are engaged in non-life insurance.

It may be desirable—this is Mr. Longley Cook again—for ASTIN to have yearly meetings in Europe and to set up committees on such points as standardization of terminology.

There are, of course, in many of the present societies in Europe and elsewhere opportunities for the presentation of papers not related to life insurance. But, Mr. Longley Cook concludes by saying that he believes that the formation of the present ASTIN section of the International Congress will be very valuable in providing a broad forum for the discussion of non-life questions.

ANALYTICAL EXPRESSIONS OF RISKS INVOLVED IN GENERAL INSURANCE

The following comments on the papers written in English, French and German under Subject IVA and published in Trans. XVth. International Congress of Actuaries 1957, formed the basis of an address by Mr. C. Philipson, Sweden, on Thursday 17th October, to the members of ASTIN in New York.

Franckx, Belgium — "Bornes du risque dans l'assurance élémentaire"

Let s_n be the maximum value of s_i and t_n the minimum value of the angular coefficient of the straight line connecting the point (s_i, A_i) with point $(1, 1)$, when i takes the values $1, 2 \dots n$ and the point (s_i, A_i) is taken to mean the vertex of the convex curve representing the generating function of the i^{th} favourable risk. In a portfolio of $m + n$ independent risks—where m are unfavourable and n favourable—Franckx finds that the superior limit of the probability that the aggregate amount of claims shall not exceed k can be written

$$I_m \frac{[1 - (1 - s_n)t_n]^n}{s_n^k}, \text{ where } I_m \text{ is taken to mean the product of}$$

the generating functions for the m unfavourable risks.

Speaking of the theory of risk as first given by Filip Lundberg and developed by Cramér and the Scandinavian School he writes:

"Cela n'empêche qu'il y a encore un monde entre la théorie et la pratique et que les actuaires n'auront la partie gagnée que dans la mesure où leurs travaux seront suffisamment simples que pour qu'ils soient et compréhensibles et directement utilisables".

An example of the direct application of the theory of Risk is the following paper by one of Cramér's pupils.

Segerdahl, Sweden — "If a risk business goes bankrupt, when does it occur?"

The writer gives numerical computations of the parameters of the well-known approximation formula for the probability of ruin (invol-

ving the loading λ , the parameter C being a function of λ , and the intensity R) for three fixed values of R . He also calculates the first two moments of the distribution in time of the first point of ruin. The calculations are carried out for three different assumptions for the distribution of risk sums, called "equal", "exponential" and "fire". The "equal" distribution can be regarded as representing industrial life insurance and the "exponential" ordinary life insurance. The "fire" distribution is based on an experience from Swedish non-industry fire insurance over the years 1948-51.

As an example taken from Segerdahl's paper, a level of $R = 5\%_{00}$ corresponds to values of $\lambda = 2.5, 5.0$ and $157.7\%_{00}$ and values of $C = .998, .995$ and $.676$ for the "equal", "exponential" and "fire" distributions respectively.

The difference between life and general insurance, as shown by the difference in λ , is due to the properties of the distribution of risk sums. In the case of life insurance this represents mainly the distribution of the sums insured and of ages within the company, whilst as regards general insurance the variation in the degree of damage is generally also involved.

Johansen, Denmark — "On fire insurance of rural buildings" and Benktander, Sweden — "On the variation of the risk premium with the dimensions of the house within fire insurance".

These two authors deal with simple cases of fire insurance, where the deviation of the distribution of the risk sum from an equal distribution can be neglected.

Johansen, observing that farm buildings when ignited will either be heavily or only slightly damaged, assumes that as far as such buildings are concerned we may base our premium calculation on the concept of total fires only. The probability of ignition is supposed to be proportionate to the sum insured, i.e. the latter multiplied by a factor dependent on the nature of the risk. The consequence of the assumption is that the risk premium is proportionate to the square of the sum insured or the risk premium rate proportionate to the sum insured. The assumptions are tested with the Danish tariffs for farm buildings and it is found that the agreement between the theory and the test material is extremely good. The theory is used for calculation of premiums for two or more buildings

where the probabilities of ignition are more or less dependent.

Benktander has proved in earlier papers that as far as the experience investigated is concerned the ignition frequency can be represented by a linear function of the sum insured; for agricultural outbuildings the risk premium rate was found to be linearly dependent on the sum insured. The risk premium rates determined from single years are analysed in two ways. Firstly, for a risk group characterised by the parameters α and β the rate $r_s^{(i)}$, for the year i and the sum insured s can be written

$$r_s^{(i)} = k_i \left(\alpha + \frac{\bar{s}}{s_i} \beta \cdot s \right), \text{ where } k_i \text{ denotes the risk premium}$$

level of the year i and the ratio between the mean insurance sum for the whole observation period (\bar{s}) and for the year i , (s_i), represents an "inflation" factor.

Secondly the risk premium rate is considered to be formed by contributions from different causes of fire. Some of these causes, of which those connected with heating and those dependent on ignition from other risks are mentioned, give contributions which are independent of s . Others, comprising causes not investigated and lightning are dependent on the sum insured; the fluctuations in the incidence of lightning produce a variation in the rate proportionate to the total rate and therefore some proportion of k_i may be regarded as the contribution from lightning.

Benckert and Sternberg, Sweden — "An attempt to find an expression for the distribution of fire damage amount"

As compared with the rectangular distribution assumed for the size of one claim by Johansen and Benktander in the previous papers, the joint authors of this paper have utilised a "condensed" Pareto function for this distribution.

The data, dwelling houses in the Southern part of Sweden, were subdivided into groups according to value, class of construction and quality of fire defence. The maximum destroyable value within a sub group is here denoted s . The amount of one claim was assumed to be distributed with the frequency function $\phi(z)$ where

$$\begin{aligned} \phi(z) &= (\alpha - 1) z^{-\alpha} & \text{for } 1 \leq z < s \\ &= s^{1-\alpha} & \text{for } z = s \end{aligned}$$

(This function can be called a "condensed" Pareto function as the tail is "condensed" to the point corresponding to $z = s$).

α was estimated for each group by the method of maximum likelihood. (During the meeting Sternberg presented some corrected values of α which showed a monotonous increase with the code for fire defence (as would be expected) within each house-class).

Benckert, Sweden — "The premium in insurance against loss of profit due to fire as a function of the period of indemnity"

In this paper Benckert has fitted a "condensed" logarithmico-normal function to the frequency function of the period of interruption in insurance against loss of profit due to Fire. By assuming the loss frequency to be independent of the period of indemnity the author is able to confine his study to loss data only; further simplification is provided by the observations showing that the amount of loss per day of the period of interruption is almost constant.

The condensed logarithmico-normal function (with the point of condensation at the end of the period of indemnity) is fitted to the frequency function of the period of interruption, as found from the data, by the method of maximum likelihood, separately for industrial and non-industrial risks. Certain tests give support to the hypothesis that the function is essentially the same for the two risk groups.

It might be remarked that the formula used by the author for the mean amount of a claim can be transformed to a form commonly used in crop insurance. On very specialized assumptions regarding plant growth, the frequency function of the weight produced by the plant, which in the formula corresponds to the frequency function of the period of interruption, is given by a truncated logarithmico-normal function (cf. Philipson, Skand. Akt. Tidskr. 1956, 1-2).

Beard, England — "Analytical expressions of the risks involved in general insurance"

The results of this paper lend support to the conclusion that generally speaking condensed distributions should be used as expressions for the distribution of the amount of one claim in general insurance.

The author has fitted two analytical expressions to data from Danish Fire Insurance for contents of buildings, covering the years 1950-54. One of these expressions is a non-condensed logarithmico-normal curve and the other log-Pearson Type I, the latter being of finite range. The only criterion adopted was to secure the equality of the mean values of the actual and theoretical curves. Both expressions agree well with the data in the region investigated. The tails of the functions in the region, where data were absent, have been compared and are found to be strikingly different from a certain point. An excess of loss reinsurance is introduced and it is found that the two expressions differ very much in their effect on the moments of the claim distribution in the reinsurance. The differences are mainly due to the fact that the range of the logarithmico-normal curve was infinite, while that of the other curve was not. It is necessary to take account of the fact that the amount of one claim will never exceed a finite value.

Almer, Sweden — "Risk analysis in theory and practical statistics"

One part of the paper deals with a risk theory of quite a general scope. The basic conception of the theory is the risk situation — or potential accident — whether or not a claim or an accident actually occurs. Each risk situation constitutes a risk element associated with a pair of probabilities (specified for each situation), namely the probability that a claim shall occur, and the conditional probability on the hypothesis of a claim having occurred that the amount of the claim shall not exceed a specified value. The analysis is confined to finite sets of risk elements, characterised by certain measures of concentration. The maximum and minimum of symmetric functions of the probabilities concerned in a finite set of independent risk elements are given. The generalisation to non-independent risk elements is discussed.

In a second part of the paper it is proved that every distribution of the amount of one claim with finite range can be expressed by upper and lower exponential polynomials. Such approximations have also been obtained by graduating actual data. The transformation to the distribution of the aggregate amount of the claims, when the number of claims is at least approximately Poisson-distributed, gives generalised Bessel-functions, which are reduced to

standard expressions by the Borel-transformation. Three methods of calculation of the distribution of the aggregate amount of the claims are devised. In all simple problems the number of claims and amount of one claim may with a small alteration be exchanged in the expression for the distribution of the aggregate amount of claims. (A special case of this theorem is treated by Ammeter, Skand. Akt. Tidskr., 1948). The ordinary risk theory based on the concept of a stochastic process with a transformed time parameter appears as a special case of the more general theory of Almer. It is further stressed in the paper that a statistical experiment for an insurance with risk fluctuations, with time and risk group, cannot be repeated. The theory afforded seems to entangle the difficulties implied in such risks.

The third part of the paper gives a summary of extensive statistical studies in Motor Car Insurance, involving compulsory third party and voluntary fire, theft and car damage insurance. The material is treated with the excess claim method, involving a partition of all claims into three classes according to the magnitude of the amount of the claims. Within each such class the i^{th} moment about zero in the distribution function of the amount of one claim is approximately proportionate to the i^{th} power of the mean of the distribution. It has further been found that the covariance between the number of claims and the amount of one claim is negligible. From this a simple expression is deduced for the mean error of the risk premium within each class. If the proportion between the number of claims in the two higher classes to that of all classes is used instead of the claim frequency in the two higher classes, or the proportion between the number in the highest class to that of the two higher classes is used instead of the frequency in the highest class, more stable measures are obtained, which may be used as a starting-point for equalisation. Within each class the variation of the number of claims and mean value of a claim, according to district, kind of vehicle, age of insurance and calendar year, can be approximately expressed by product factors, one for each basis of partition. The estimation of the factors has been based on the principle of least squares and tested with the χ^2 -method. The sums of squares have been found to have a distribution function with certain similarities with the distribution of χ^2 based on a normal

deviate. Theoretically the distribution studied is represented by a series of terms of the same form as the distribution of χ^2 for a normal deviate.

Mattsson and Lundberg, Sweden — "Risk functions of Swedish sickness insurance"

Formulae for capital values and premiums are given in terms of the sickness annuity technique, based on the concept of a probability of falling sick applied to the number of persons living instead of the number of actives. Analytical expressions for the intensity of falling sick and for the decrement function used in the bases of the sickness insurance are defined. Having regard to the developments by Almer it is interesting to note that these expressions have the form of exponential polynomials.

Ammeter, Switzerland — "Anwendungen der kollektiven Risikotheorie auf Probleme der Risikopolitik in der Sachversicherung"

In earlier works the author has developed methods of generalising the collective risk theory for application to general insurance. This generalisation is based on the negative binomial distribution. The development of the risk business is thus interpreted in terms of the Polya process, also studied by Ove Lundberg in his dissertation (Uppsala, 1940).

The paper utilises the Polya process for dealing with a portfolio composed of different risks, mutually independent or dependent. When the loadings are sufficient for each risk group to ensure a certain level of the intensity R , implied in the main term of the probability of ruin, the author talks of "natural" calculation. As this method cannot, however, be used in practice, the author suggests that loadings shall be determined in order to ensure sufficient premiums for the total portfolio. The method is illustrated by numerical examples.

Philipson, Sweden — "On some distribution functions related to a specified class of stochastic processes"

Starting with a definition of the multivariate process, i.e. a process where a vector of parameters is substituted for the parameter of a univariate process, the author states that under certain

conditions a multivariate process can be transformed to a univariate process. (Taking the opportunity to correct an error it might be remarked that in the second sentence of para. 1 on p. 265 of the paper the words "for every fixed value of ω_1 " shall be inserted between the words "which" and "either"). A class of processes is then defined, which is called the H class, where H is defined by $\mu_1 (1 + H) = \mu_2$; μ_1, μ_2 being the first two semi-invariants of the distribution of the number of changes in the random function attached to the process. A general expression for the probability of exactly ν changes, while the parameter u passes from u to $u + du$, is given. It is shown that the Poisson, the Polya, the Arfwedson (Skand. Akt. Tisdkr. 1955, 1-2) process and the two processes which may be derived from the formulae given by Ammeter (Ibid., 1948, 3-4) belong to the class. The distribution of the size of one change is, for the Poisson and the Polya process, assumed to be dependent on the parameter. These distributions, for all cases, are assumed to contain one absolutely continuous component, and to have finite moments to the 6th order inclusive. On the condition that $H > -\frac{1}{2}$ and bounded, the distribution function of the normalised random function is expanded by the aid of a method given by Ammeter (l.c.) in an asymptotic expansion of which the usual expansion for the distribution of the gain (cf. Cramér, Skandia Jubilee Volume, Stockholm, 1955) is a special case. Expansions for the distribution of the sum of squared deviates and the ratio between the two independent variance estimates are also given. (The index of k under the summation sign in equation (17) p. 274 of the paper should be $n + 2i$).

Sparre Andersen, Denmark — "On the collective theory of risk in the case of contagion between the claims"

This paper is an application of risk theory to a special case of contagion between the claims.

The theory is based on the assumption that the probability of a claim in the time interval $t, t + \Delta t$ (t being the operational time) can be expressed as $\Delta t g(\tau) + o(\Delta t)$, when the preceding claim occurred at time $t - \tau$. Further a claim is simulated at time 0 to give a simple expression for the probability of the next claim. The choice of $g(\tau)$ is restricted, it should be non-negative, its

integral between 0 and 1 convergent and its integral between 0 and ∞ infinite. If $g(\tau) = \text{constant}$ the usual form of the collective risk theory is obtained. It is proved the probability of ruin fulfils an inequality of the usual form. The integral equation satisfied by this probability is also given. As an example definite forms of $g(\tau)$ and of the distribution of the amount of one claim are assumed which lead to simple formulae for the ruin probability. A numerical example shows that this probability is much higher when $g(\tau)$ is varying than in the case of constant $g(\tau)$ with the same loading.

Campagne with the collaboration of Driebergen, Netherlands —
"The influence of chain reactions on the loss distribution function"

A chain reaction is defined as "a process in which one event insured against, happening to a certain object, produces a number of similar events, which events in their turn cause similar events to once again other objects, etc.". It is said that in models previously used with dependent probabilities, as for instance the Polya-Eggenberger process, the possible occurrence of chain reactions has not been taken into account.

For the further development this general concept is restricted to cases with the same degree of mutual dependency and with an alternative risk, i.e. that each event causes a total loss of the object in question. Utilising well-known properties of generating functions the authors deduce in an ingenious way necessary formulae for the different probabilities involved. The theory is applied to three models of the basic function of the chain reaction. The numerical calculations, carried out with the electronic computer ARMAC, show the necessity of having regard to the influence of chain reactions, when judging the probability of ruin with available funds.

It might be remarked that, in case of fire insurance, the measurement of the contagion involved in the chain reactions is dependent on the definition of a risk. Suppose that we have to deal with a number of buildings, each building being a separate risk, a mutual contagion between the ignition frequencies of the buildings will then be revealed as such in the statistics of the number of claims. If, on the other hand, the risk is defined in such a way that several buildings will belong to each risk, the contagion between the fire

frequencies with regard to each building within one risk will influence the frequencies of the amounts of one claim. Allowing for partial fires in each building this remark can be applicable to different parts of the same building.

A further remark will also be made. If the degree of mutual dependency is unequal for different risks involved the model will, as mentioned by the authors, be more complicated. In such a complicated model the process is probably not of the Markoff class, i.e. the probability of a claim occurring in a given short period of time depends not only on the status at the beginning of the period but also on the order of events before that time point. For such complicated models the Polya process is not applicable. When the model is simplified as much as the authors have assumed for deducing the probabilities involved, it might on the other hand be possible to apply Markoff models of more or less complicated nature. It could perhaps also be possible to use a model related to that described by Sparre Andersen in the paper reviewed above. In this connection it seems interesting to investigate whether Almer's remarks on dependent risk elements (Subject IVa, pp. 322-324) could be used to elucidate the interesting problem of chain reactions.

Thépaut, France — "Calcul du plein de conservation dans l'assurance des corps de navire"

Starting with an approximation to the probability of ruin based on the collective theory of risk, the author calculates the full amount of retention for French Marine Insurance, based on experience covering the years 1950-54. He finds the self-retention relative to the risk reserve for the different marine branches investigated to lie between 1.36 and 4.70 per cent with a probability of ruin of 10^{-6} and a profit coefficient of 10% of the risk premiums. For invalidity, non-industrial fire and industrial fire insurance the same computation gives 3.8, 2.5 and 2.1% respectively for the self-retention which, thus, is of the same order of magnitude for quite different branches of insurance.