#### 1989 CASUALTY LOSS RESERVE SEMINAR

#### 4B-2: RESERVING FOR AUTO WARRANTY PROGRAMS

Panel

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Gary V. Nickerson Universal Underwriters Group MR. HOLDREDGE: This is a 40-minute session entitled "Reserving for Auto Warranty Programs." My name is Wayne Holdredge. I'm a Tillinghast consultant, I spend a significant portion of my time evaluating automobile extended warranty programs. Gary Nickerson, Actuary and Vice President of Universal Underwriters, s also here. His company insures automobile extended warranties, and Gary has been involved in evaluating them for his company.

To my knowledge this is the first time this topic has been presented at a casualty loss reserve seminar. The reason it has received so little attention in the past may be lack of knowledge or interest rather than lack of importance. A list of companies that in some way are, or have been, involved with this product includes many fam liar names. Such companies as Metropolitan, Prudential, Aetna, Travelers, GEICO, Continental and Maryland Casualty are among those currently involved. There is no way to determine how much premium is written from this product from publicly available information. Sometimes it is recorded as general liability premium and included on the general liability premium and included on the general liability line for statutory reporting. Other times it is shown as auto physical damage. Sometimes it is listed separately or mixed with other warranty-type coverages and shown as a write-in. Consequently, no one knows just how much premium is written premium is written each year. From my experience I would estimate the annual written premium is well over \$100 million dollars.

For the next 40 minutes, we are going to introduce you to extended auto warranties. Gary will begin by giving you some background about such things a what is covered and who is protected. He will explain some things about this product that are important to understanding the actuarial issues. I will follow by explaining why this product is interesting from an actuarial perspective. We expect to have a few minutes left at the end for questions.

Without further ado let's begin. Here is Gary Nickerson.

MR. NICKERSON: Well, there are some unique features to this product, and in fact this session is a little different from most of the sessions that you are attending over the two days in that most of the other sessions are on general topics or me hods that can be applied for a lot of different areas of insurance. This session deals w th one product in particular, auto warranty programs or extended service contracts.

Because of some of the unique features of this type of product, there are some actuarial issues that are very different than for other casualty products.

Let's first of all take a look at the product itself and see some of the coverage issues, and then Wayne will talk about the actuarial issues.

I will assume we are talking about an insured program of extended service contracts. There are possibly programs out there that are not insured programs, but I will assume we are talking about an insured program.

You can see we have some overheads. There are copies of all of the overheads that will be distributed. In fact, it was even my intention to distribute them at the beginning and I forgot.

MR. HOLDRIDGE: Shall I pass them out?

MR. NICKERSON: Yes, if you will. so it will save you on some note-tal ing.

#### (Exhibit)

First of all, what does this product cover? It covers the peril of mechanical breakdown. In other words, this is health insurance for cars.

In a lot of ways cars are like people. The older we get, the more likely it is that something is going to have to be fixed, and that is the way it is with cars. In fact, that is a very important feature of this product. It has a big influence on the actuarial issues involved with this product.

What does it pay for? Primarily it is paying for the cost of repairs. This would include both parts and labor. Some contracts will also pay for towing and the expense of a rental car.

In an insured program who is insured? There is more than one way of dealing with this type of insurance. One way is a traditional arrangement between an insurance company and a car owner. This would be under the guise of mechanical breakdown insurance.

Another way of insuring this product that is very common is an indirect way. This is a service contract reimbursement insurance policy. Here the insurance is between the insurance company and the auto dealer. The auto dealer will issue service contracts to car buyers. Those contracts themselves are not insurance; however, they are indirectly backed up by the insurance between the insurance company and the auto dealer.

The car owner cannot tell too much difference between the two, but those are two different ways of dealing with this as an insurance program.

The measures of exposure are a little more complex than some insurance products in that it is two dimensional. This is a very important feature of this product, the fact that both time and mileage are important components of exposure.

Limits to this coverage are usually expressed in both time and mileage. For example, a limit to an extended service contract might be thirty-six months and fifty thousand miles, whichever comes first. It is always whichever comes first.

We must never forget that both of those components are very important. Don't become too enamored with just the time part of it, for example, thinking that, well, this is a three-year contract and that over there is a four-year contract. The mileage associated with that limit is very significant.

What components are covered? It varies a lot from contract to contract. I would say that the extended coverage falls into three main categories. One would be power train coverage only. This is very basic coverage and it would be bare-bones type of coverage.

The broader form of coverage would be power train and other named components and the broadest of all would be comprehensive or all-risk type of coverage.

Manufacturers' warranty have a major impact on coverage. For new programs manufacturers' warranty acts as an indirect deductible. A complicating factor is that there is a lot of variation by manufacturer.

This next overhead gives a sample.

(Slide)

It gives you a warranty comparison of 1989 models for three different manufacturers. You can see that they are all very different. There is not too much of a pattern of consistency from one to the other.

Ford, for example, has twelve-month, twelve thousand mile warranty for all components. It has an extension for power train components up to seventy-two months, sixty thousand miles.

GM and Toyota do not make any distinction on the type of component. Everything is covered for whatever their limit is, in GM's case, for example, thirty-six months and fifty thousand miles. In some ways it is more coverage than Ford and in some ways it is less, depending on the component.

To make this even more complicated yet, for a given manufacturer we see a variation in the term of their warranty over time.

This overhead gives you an illustration of General Motors' warranty over the last four years.

(Slide)

As you can see, back in 1986 all components were covered for twelve months, twelve thousand miles with the exception of power train for thirty-six months or thirty-six thousand miles.

In 1987 the power train coverage increased. In 1988 it stayed the same, two years in a row, a record.

In 1989 it changed again. The coverage for power train components actually contracted but all other components were extended rather significantly.

Since this acts as an indirect deductible on new car programs, these variations over time and also among manufacturers have a very major effect on this product. It has a very major effect on the extended service contract, so any actuarial analysis would have to take account of that.

Another coverage issue I will bring up would be the fact that new car programs are very different from used car programs. They have different actuarial characteristics, so any type of analysis of data would typically separate these two programs as well as the other things we have been talking about.

The last coverage feature I will address would be that of deductibles. This would be a deductible per claim. They might be present on the manufacturers' warranty. They can also be present on the extended service contract and it can vary by component with a lot of variation. Anything that can vary does, so deductible and the size of deductible is another variation in coverage that is significant for us.

That brings us now to our actuarial issues. Since this is a Casualty Loss Reserve seminar we are interested in the liabilities.

There are two liabilities of interest for us to estimate, the loss reserve liability and the liability for unearned premium reserve. For probably every other sess on besides this we are talking about loss reserves, not unearned premium reserves, and it is because the under premium reserve is very straightforward. You can calculate it using the pro rata

method. There is nothing to talk about. There is nothing to do. It is just plugged in by formula. Loss reserves, on the other hand, are very complex and there are a lot of interesting things to delve into.

Wayne is now going to explain to us why for this program it is exactly the opposite.

• PERIL: MECHANICAL BREAKDOWN

IT PAYS FOR:

-REPAIR (LABOR & PARTS)

-TOWING

-RENTAL CAR

WHO IS INSURED?

• MECHANICAL BREAKDOWN INSUFANCE CAR OWNER

SERVICE CONTRACT REIMBURSEMENT

AUTO DEALER

MEASURES OF EXPOSURE

• TIME

• MILEAGE

COVERED COMPONENTS

•POWER TRAIN

• POWER TRAIN AND OTHER NAMED COMPONENTS

•COMPREHENSIVE

#### MANUFACTURERS ' WARRANTIES

·IMPACT ON COVERAGE

VARIATION BY MANUFACTURES

•VARIATION OVER TIME

WARRANTY COMPARISON

1989 MODELS

MANUFACTURER	All Components <u>Months/Miles</u>	Power train Month S/Miles
FORD	12/12,000	72/60,000
GM	36/50,000	36,50,000
TOYOTA	36/36,000	36/36,000

# WARRANTY COMPARISON

ALI	Nents	POWERTRAIN
COMPOI	/Miles	MONTHS/MILES
GENERAL	motors	

	COMPONENTS MONTHS/MILES	MONTHS/MILLE
MODEL YEAR	12/12.000	36/36,000
1986	12/2	
1987	12/12,000	72/60,000
-		
	12/12,000	72/60,000
1989		
	36/50,000	36/50,000
1989		

DEDUCTIBLES

, MANUFACTUER'S WARRANTY

.EXTENDED SERVICE CONTRACT

ACTUARIAL ISSUES

·LOSS RESERVES

UNEARNED PREMIUM RESERVES

Gary mentioned that this product presents an interesting actuarial issue. Although we are at a loss reserve seminar, it is not loss reserves, as we generally use those terms, that are interesting from an actuarial perspective. Loss reserving, i.e., reserves for claims that have occurred, for this product is relatively simple. Usually a decision about whether a claim should be paid, or denied, is made as soon as the claim is reported (generally within a few days of the occurrence). Application of the basic loss reserving methods is likely to produce reliable estimates of the ultimate payment on claims that have already occurred.

The more interesting, and more challenging, issue is the unearned premium reserve. In theory, premiums (at least the pure premiums) should be taken into income, i.e., earned, according to the pattern by which covered losses occur. For most property and casualty coverages, the assumption that losses are expected to occur evenly throughout the term of the policy, which is usually one year or less, is a reasonable assumption. There are very few property and casualty coverages for which losses would not be expected to occur evenly throughout the policy term, and in those cases the differences are small enough to allow the simplifying assumption to be reasonable. In many respects, this product resembles a life insurance or long-term health insurance product since the probability of loss generally increases throughout the policy term.

(<u>SLIDE 1</u>) In the case of auto service contracts, and mechanical breakdown insurance, the assumption of covered losses occurring evenly throughout the policy term is not reasonable for two reasons:

- 1. Manufacturers' warranties cover a very large proportion of the mechanical breakdowns during the early portion of the contract term. These factory warranties are from one year to seven years depending upon the manufacturer and the components covered, as Gary has already shown you. As much as 90% 95% of the losses during the manufacturer's warranty will be covered by the manufacturer's warranty.
- 2. The incidence of mechanical breakdowns varies over the life of a vehicle. For example, there may be a relativel/ high probability of breakdown early in the life of a new car (until the initial bugs are worked out). Then the low probability of breakdown begins to rise as the car ages and parts begin to fail.

The combined affect of these two factors results in relatively few loss occurrences during the early portion of a new car contract (while the factory warranty is in place) and significantly more losses during the later portions of the contract (after the manufacturer's warranty expires and as the car begins to deteriorate mechanically).

Earning the premiums (and for these purposes we will refer to premiums as pure premiums, which are often referred to as reserves by those operating in this field) evenly throughout the term of the contract is like y to result in a very poor match of revenues and loss payments. (Slide 2) Here is an example of the expected loss occurrence pattern for a 6 year/60.000 mile service contract with a 3 year/50,000 mile manufacturer's warranty. At the end of one year only 3% of the losses have occurred. If the premium is earned evenly,

i.e., pro rata, throughout the six-year term, approximately 16% of the premium would be earned. Even if the coverage is perfectly priced (defined for these purposes as the ultimate ratio of losses to premiums of 100%), at the end of one year 3% of the losses compared to 16% of the premiums would produce a ratio of 19%. Such an attractive result may raise doubts in the minds of those that don't understand this coverage about whether the product was overpriced.

At the end of two years the ratio of losses to pro rata earned premiums would be 24%, further confirmation of a potentially overpriced product. The ratio will continue to look attractive until near the fourth year, at which time this perfectly priced product will appear underpriced until all losses are incurred and all premiums are earned.

In theory premiums should be earned in the same proportion as the losses occur. In this example, using the correct premium earnings pattern will produce a consistent ratio of losses to premiums of 1.00. Pro rata earnings produced ratios of from less than 20% to over 110% during the term of the contact. Even if there are no regulatory requirements for earning premiums, it will be difficult, if not impossible, to make optimal business decisions until all contracts have expired unless losses and premiums are matched as nearly as they can be.

An interesting actuarial exercise is the determination of the patterns by which service contract premiums should be earned. (Slide 3) If a large and reliable data base is available, simply determining the patterns by which losses occur for each plan is sufficient. Arraying the losses in the familiar

loss development triangle, determining report-to-report development factors and development factors to ultimate will give us the necessary information to determine the appropriate premium earning patterns. This slide shows a typical example of the determination of the premium earning pattern. Many of the problems we have with similar loss reserving techniques, such as what tail factor to use if data is incomplete and how to combine the report-to-report factors to produce reliable projection factors for the fiture, exist here also.

The correct premium earning patterns for auto service contracts are not Each combination of time and mileage limits produces a different trivial. earnings pattern. We already have seen an example of how a pro rata earnings pattern produces less than optimal results. (Slide 4) For used cars, which usually have much shorter time and mileage limitations, a prc rata pattern may produce fairly reasonable results. However, earning patterns for new car plans are more interesting. (Slide 5) Some companies use the simplifying assumption of earning the premiums according to the reverse rule of 78's. While this may produce more satisfactory results for new car plans than a pro rata pattern, the differences still can be significant. For example, look at the pattern produced by the reverse rule of the 78's for the 6/60 plan we looked at earlier. The reserve rule of 78's produces the same earning patterns for all plans with the same time limitation. (Slide 6) We can see from this slide that the loss occurrence pattern varies significantly by mileage limitation. (Slide 7) Also the manufacturer's warranty significantly affects the loss occurrence, and hence the premiums earnings, patterns.

Understanding the importance of properly earning the premiums is only a small portion of the problem in this case. There is no widely accepted publicly available data base from which to develop earning patterns. No rating bureau or statistical agent captures and publishes loss data in a format that will permit the determination of premium earning patterns. Such a data base would need to include many years' data. However, manufacturers' warranties have not been constant for a long enough period of time to allow complete data to be captured and evaluated in order to determine prices for new plans. In addition time and mileage limits of the extended service contracts have been changed often over the past several years.

The question of how to determine premium earnings patterns for new time and mileage limitation combinations and manufacturer's warranties remains. The earnings patterns, in addition to the prices, must be determined before the contracts are sold. The only effective way to determine such patterns and prices prospectively is through computer modeling. Modeling such things as mileage driven, loss probability over time, losses covered by the manufacturers' warranties and numerous other variables can produce patterns that, although perhaps not precise, are more accurate than any rule of thumb of which I am aware.

In addition to the problem of proper premium earning patterns, there is the potential problem of a deficiency in the unearned premium reserves. If a reliable accurate earnings pattern were known, and prior to the expiration of all service contracts, the ultimate loss projections from the in-force contracts indicated an underwriting loss was expected, how should such an underwriting loss be treated? The principles of statutory accounting would

indicate that such a liability, or at least a corresponding segregation of surplus, should be shown. There may be state insurance departments that require such a treatment of the deficiency in the unearned premiums, but I am not aware of them. In fact, in one particular case of which I am aware a state insurance department not only didn't require such a handling of an obvious deficiency, they specifically requested such a liability or segregation of surplus not be shown. For GAAP accounting purposes the deficiency in the unearned premiums should be shown.

We would like to stop at this point to allow time to discuss any part of what Gary and I have talked about that is of interest or any other questions you may have on this topic. If there is sufficient interest, at a later Casualty Loss Reserve Seminar, Ratemaking Seminar, or at a CAS meeting, we could have a more complete discussion of the topic. Such things as the data necessary for a complete data base for pricing and determining earnings patterns could be discussed.

### CASUALTY LOSS RESERVE SEMINAR

Session 4B - 2

### **RESERVING FOR AUTO WARRANTY PROGRAMS**

### Why Service Contract Losses Do Not Occur Evenly Throughout Contract Term

- Manufacturers' warranties cover a large proportion of mechanical breakdowns during the early portion of the contract term.
  Example: 6 year/60,000 mile service contract covering a new car with a 3 year/50,000 mile manufacturer's warranty.
- Likelihood of a mechanical breakdown changes as a car ages. Typically a high initial incidence of breakdowns is followed by a low loss frequency which gradually increases over the life of the car. Also, in general, the average paid claim increase as the car ages.

6 Year/60.000 Mile Service Contract with 3 Year/50.000 Mile Manufacturer's Warranty



Years

### CASUALTY LOSS RESERVE SEMINAR

### Session 4B - 2

Company A Incurred Losses

	Evaluation Point							
Effective Year	1	2	3	4	5	6	7	8
1	 0 69	 5,315 17.997	 15,718 33,726	25,388 73,039	35,094 110,116	46,693	51,785 166,041	63,873
3	1,116	13,455	41,588	73,681	97,378	127,798		
4	0	15,575	38,121	58,376	79,291			
5	1,509	19,528	39,378	64,562				
6	827	22,319	49,154					
7	1,524	17,316						
8	3,542							
	1-2	2-3	3-4	4-5	5~6	6-7	7-8	8-ult
Average Rep	ort to Re	eport Fac	tors:					
	15.878	2.230	1.671	1.387	1.313	1.214	1.162	1.245
Selected Fa	ctors:							
	15.000	2.250	1.670	1.390	1.320	1.210	1.160	1.155
	1-ult	2-ult	3-ult	4-ult	5-ult	6-ult	7-ult	8-ult
Factors to	Ultimate:							
	177.463	11.177	4.967	2.975	2.140	1.621	1.340	1.155
	l yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr
Percent of	Ultimate	Incurred	Losses:					
	0.006	0.089	0.201	0.336	0.467	0.617	0.746	0.866



6 Year/60,000 Mile Service Contract with 3 Year/50,000 Mile Manufacturer's Warranty



Comparison of Various 6 Year Programs



Years

Comparison of Differing Manufacturers' Warranties

