

TRANSACTIONS

APRIL, 1958

SUPPLEMENTARY DEATH BENEFITS IN PENSION PLANS

HARWOOD ROSSER

EVOLUTION

THE trusted pension plan is now a widespread American institution. Sometimes a supplementary death benefit is included at the outset. In the more typical case, however, the pension plan was set up first, perhaps with some trepidation as to its cost, using a trustee. Later, after management had lived with it a while, it was realized that a pension plan alone offered little inducement to younger employees to remain. Even in the case of an older employee, his family would receive nothing as a result of the company's contributions, if he died before retirement age. Their feeling of being unfairly treated, in such a case, would be enhanced if the pension included a term certain period, such as ten years.

Obviously, a death benefit would fill the gap. However, a consulting actuary who would recommend a trusted pension plan might readily suggest insuring the death benefit. On a pension plan, losses due to unexpected longevity emerge slowly, and are usually payable in monthly installments. (To quote: "People don't live long suddenly.") But an epidemic or a plant catastrophe could involve a staggering amount, payable over a short period.

The insurance to be obtained could be with or without cash values. In the latter case, it would normally be group term. This has disadvantages, especially from the employee's viewpoint. If he leaves his employer, the conversion privilege is generally available only at attained age. Usually coverage is reduced at retirement, or ceases altogether. If not, the cost becomes prohibitive. (For noncontributory employees, group term has an important offsetting tax advantage.)

An alternative that eliminates these drawbacks calls for permanent policies with cash values. These are often obtained with group under-

writing, billing and administration in general. The policies are commonly issued with the trustee as owner. Here an employee who retires or withdraws has the opportunity of retaining the insurance at the original issue age. At retirement, the trust fund receives the cash value, from either the insurer or the insured, to be applied toward providing the pension.

A variation is to have the pension paid by the insurer, rather than by the trustee. In this case, the transfer of funds, if any, is in the other direction; and continuation of the full death benefit after retirement is generally impractical.

Whether included at inception or added later, and whether insured or not, death benefits will be here regarded as distinctly secondary to retirement benefits.

GOVERNMENTAL REGULATIONS

In order to receive full Federal tax advantages, the plan must satisfy a multiplicity of requirements, both statutory and otherwise. A plan which does so is called "qualified."

Funding Methods

There is a wide variety of funding methods that are acceptable to the U.S. Treasury Department. We shall concern ourselves only with the "Clause (C)" group,¹ known earlier as "Clause (iii)." These are usually preferred for trustee plans. Under this approach, costs are divided into two kinds: past service cost and normal cost.

The maximum tax deduction in any one year is usually the normal cost, plus 10% of the past service cost. The "safe" minimum deposit to the trust, in order to avoid "unfunding" (*i.e.*, increasing the unfunded portion of the past service cost), is the normal cost, plus interest, at the assumed valuation rate, on the unfunded past service cost. Even this is not an absolute minimum, as temporary unfunding is countenanced in certain circumstances.

Thus, as long as any unfunded portion remains, there is a considerable range within which the employer may select his payment for the year. The flexibility so provided, which facilitates adjusting to current business conditions, accounts largely for the popularity of "Clause (C)" funding methods.

The most basic of these is the Entry Age Normal method. As the name implies, the normal cost hereunder is determined as a level amount, or a level percentage of payroll, from the beginning of credited service of each employee until his normal retirement age. This corresponds to the level premium on an insurance policy dated back several years (as through a

¹ Internal Revenue Code of 1954, Section 404 (a) (1) (C).

change). The parallel may be extended. The accrued liability at any time is similar to the prospective policy reserve. It equals the present value of future benefits, less that of future normal cost payments. The past service cost is the accrued liability at the outset of the plan.

Accrued Liability and Future Normal Cost

The accrued liability is thus a function of the funding method, rather than of the service prior to the valuation date (except in the case of the Unit Credit method). This is quite difficult to explain to a client, and probably not worth while except in unusual circumstances, such as a plan termination. Some funding methods utilize the prospective formula, referred to above, to obtain the accrued liability; and an average entry age is often used to simplify the figure work. Others, such as the Unit Credit method, employ the single-premium approach.

This approach is straightforward, and calculates the accrued liability directly. But it presupposes that one knows what pension credits have been earned to date. This is sometimes difficult to ascertain. Take, for example, a plan that provides a pension of one-half of the final ten-year average pay, less Social Security benefits. (If early retirement is permitted under such a plan, say on the basis of "earned" pension credits, actuarially reduced, there are several possible interpretations. If the plan instruments are properly drawn, this will be covered.)

This difficulty is avoided by methods using the prospective formula. We obtain the present value of benefits for all service, past and future, and deduct the discounted future normal cost to obtain the accrued liability.

NUMERICAL ILLUSTRATION

To facilitate the comparison of some of the methods of funding, with particular reference to the inclusion of supplementary death benefits, a numerical example is included. Table 1 gives the bases for computation. Certain simplifications have been adopted in the choice of bases, in order that we might more readily concentrate on the effect of the alternatives under consideration, rather than illustrate the ramifications that a consultant encounters. For instance, a single individual is dealt with. Also, salary progression has been ignored. Likewise, the troublesome questions of integration with Social Security benefits, or their use as offsets, have been avoided.

Table 2 shows the results of these assumptions, for the first year of the plan. To carry it forward for later years would simply be to illustrate the familiar rising-cost tendency of the Unit Credit method. Under our assumption of a constant salary, column 5 would remain unchanged until

retirement, and column 6 would be unaffected for at least ten years. The inclusion of the Unit Credit method is for the purpose of broadening the comparisons, and should not be construed as constituting its recommendation for this type of coverage. The normal cost under it is the counterpart of annual renewable term premiums, which increase yearly.

TABLE 1
BASES FOR NUMERICAL ILLUSTRATION

<i>Employee Data:</i>	
Age	35
Service.....	10 years, all deemed creditable
Salary	\$500 monthly
<i>Benefit Formulas:</i>	
Pension.....	1% of monthly salary for each year of service, both past and future, payable monthly for life, starting at 65
Death.....	100 times estimated monthly pension, payable at death before 65, and insured where provided
<i>Benefit Amounts:</i>	
Pension.....	\$200 monthly, being the result of 40 years at \$5 a month (assuming a constant salary)
Death.....	\$20,000
<i>Assumptions:</i>	
Mortality.....	1951 Group Annuity (Male), before and after retirement. See Reference (2), pp. 262-263.
Termination.....	Very moderate rates; namely, T-1 from Reference (3). This includes mortality. After age 50, withdrawal rates are zero.
Interest.....	3%, compounded annually
Salary Scale.....	None, for simplicity
<i>Insurance Data (per M):</i>	
Term to 65.....	Annual Premium: \$12.02
Whole Life.....	Annual Premium: \$21.37; cash value at 65: \$528.29

The left-hand side of Table 2, labeled "Single Premium Method (Unit Credit)," will be discussed first, and then the right-hand side, headed "Prospective Formula (Entry Age Normal)." The actual formulas employed in the calculations are shown in Appendix A.

SINGLE PREMIUM METHOD

No Death Benefit

At this point there is only a pension benefit. The same amount of pension will be credited for each year of service. The amount attributed

to past service is one-fourth of the anticipated total. The results appear in line 1.

Inclusion of Death Benefits

In adding an insured death benefit, we suppose that the premiums are included in the regular payments into the trust, and then transmitted to

TABLE 2
 COSTS FOR ONE MAN AT INCEPTION OF PENSION PLAN
 (Assumptions as Shown in Table 1)

	SINGLE PREMIUM METHOD (UNIT CREDIT)			PROSPECTIVE FORMULA (ENTRY AGE NORMAL)		
	Past Service Cost (1)	First Year Normal Cost (2)	Maximum Deduction (3)	Past Service Cost (4)	First Year Normal Cost (5)	Maximum Deduction (6)
1. No Death Benefit	\$1,875.56	\$187.56	\$375.12	\$3,439.88	\$235.02	\$579.01
2. With Insurance, All Attributed to Future Service:						
a) Term:						
Pensions	1,875.56	187.56	.....	.....	.....	.....
Ins. Premiums . . . . .	.....	240.40	.....	.....	.....	.....
Total	1,875.56	427.96	615.52	.....	.....	.....
b) Whole Life:						
Pensions	1,875.56	87.91	.....	.....	.....	.....
Ins. Premiums . . . . .	.....	427.40	.....	.....	.....	.....
Total	1,875.56	515.31	702.87	.....	.....	.....
3. With Insurance, Attributing a Portion to Past Service:						
a) Term:						
Pensions	1,875.56	187.56	.....	.....	.....	.....
Ins. Premiums	1,038.85	180.30	.....	.....	.....	.....
Total	2,914.41	367.86	659.30	5,345.18	365.19	899.71
b) Whole Life:						
Pensions	1,128.21	112.82	.....	.....	.....	.....
Ins. Premiums	1,846.94	320.55	.....	.....	.....	.....
Total	2,975.15	433.37	730.89	5,456.58	372.80	918.46

the insurer by the trustee. The advantages of this course are the simplification of the tax returns and supporting data, and the widening of the choice of deductible amounts. The latter theme will be more fully developed.

The simplest case with death benefits, from the viewpoint of funding, is the one using term insurance, with the cost being regarded as attribut-

able all to future service. This is line 2(a) of Table 2. The only difference from line 1 is the addition of the annual premium to the normal cost of the pension. (For validity of comparison, a level term to 65 premium has been employed. In practice, annual renewable term premiums, under a group contract, would be more likely. This would accentuate the rising-cost tendency under the single-premium approach.)

Addition of Cash Values

Line 2(b) substitutes a whole life policy for the term coverage in the preceding. Now, however, there will be a substantial cash value available at retirement age to help provide for the pension. There are various ways to recognize the building up of these cash values outside of the trust fund, including the following:

- A. Use the actual cash values as shown in the policies. While theoretically correct, this is very laborious in a sizable case. This becomes even more so under the usual practice of issuing an additional policy whenever an individual's salary has increased more than a certain amount since his last policy was written. The Treasury Regulations do not require the use of actual values.
- B. Ascertain the amount of pension purchasable by the cash value at retirement. Divide this by the number of years of future service, and treat this level amount each year as being provided by the cash value. An exact equivalent that is simpler to compute is to divide the cash value at retirement by the years of future service, and each year to subtract the present value of this pure endowment from the normal cost of the gross pension credit for the year. While approximate, this avoids the laboriousness of (A). It is wholly consistent with the Unit Credit method, but less so with level cost methods.

Accordingly, we have used (B) in computing line 2(b). The presence of the cash values has served to reduce the normal cost of the pension from \$187.56 to \$87.91.

Allocation of Insurance Costs

It is not logical, however, to regard all insurance premiums as future service costs when some of the cost of pensions is being assigned to service prior to inception. Where there are cash values, this can be brought into clearer focus by considering an extreme case. Imagine a man entering a plan with one year to go until retirement and forty years of creditable past service, with benefit formulas as in Table 1. However, the death benefit is to be provided for by a single premium whole life policy. It is obvious without calculations that, under either (A) or (B), if the cash

value be deemed to apply only to the one year of future service, there will be a negative normal cost for the pension portion that year. While this is a most unlikely instance, it is theoretically possible; and a satisfactory theory should cover the limiting cases also.

Thus, we propose that it is more defensible to attribute some portion of the insurance premiums and values to past service. This makes more sense when the death benefit is defined, as here, in terms of the ultimate pension, some of which will be allocated to past service for employees who are eligible when the plan is first installed. It is lent further support by the fact that fully insured pension plans sometimes provide different policies for prior service, and may even use a different policy form.

The appropriate modification in (B) is to replace "future service" by "total creditable service." This means that the proportion allocated to past service will then be $(x - y)/(r - y)$, where

x = age at entry into plan,

y = age at which creditable service began, and

r = retirement age.

This proportion could also be used for (A).

Lines 3(a) and 3(b) of Table 2 demonstrate the application of this principle. Just as, in this illustration, one-fourth of the total pension is deemed to derive from past service, one-fourth of the insurance is similarly attributed. In column 1, one-fourth of each annual premium to retirement date has been discounted. For the whole life policy, one-fourth of the cash value at retirement age will be available toward the "past service" portion of the pension.

This leaves three-fourths of the insurance allocated to future service. The premiums in column 2 are adjusted correspondingly. Likewise, only three-fourths of the cash value is applied to reduce the pension normal cost. Thus, \$112.82 could have been found by interpolating one-fourth of the way from \$87.91 to \$187.56.

PROSPECTIVE FORMULA

For the Entry Age Normal method, the proportion for past service is $\ddot{a}_{\mathbf{y}:\overline{x-y}|}/\ddot{a}_{\mathbf{y}:\overline{r-y}|}$, which may also be written as $(N_{\mathbf{y}} - N_x)/(N_{\mathbf{y}} - N_r)$. (If more than one force of decrement applies, these functions are derived from the survivors' column of a service table.) This proportion is built into the Entry Age Normal method, irrespective of whether or not any insurance is involved. It is never less than $(x - y)/(r - y)$, and generally is greater. This is why, throughout Table 2, this method produces a higher past service cost than does the Unit Credit method.

Since this proportion is predetermined under the prospective formula, there is no counterpart of the situation where all of the insurance is deemed to apply to future service. Hence, line 2 is blank on this side.

Inclusion of Insurance

The simplest way of dealing with the inclusion of insurance is to calculate the present value of future benefits as the sum of that for pensions and of discounted future premiums, less the discounted cash values at retirement age. This value is multiplied by the above proportion to obtain past service cost. To obtain normal cost, it is further discounted to entry age, and then divided by an annuity from entry age to retirement age. The results are given in line 3. It will be noted that, of the methods shown, this gives the maximum flexibility of funding.

Under this treatment, the cost of adding a death benefit is, in terms of present values, the excess of discounted gross premiums over the discounted cash value at age r . In one sense, this overstates both past service and normal costs slightly, because of including the loading element of future premiums. On the other hand, this must eventually be paid for those who remain. To the extent that the assumptions are a correct estimate of future experience, this is all that is provided for. Even if true net premiums were readily available, the assumptions upon which they were based would seldom coincide with those of the consultant. However, this is sufficient trespass upon debatable ground: to wit, the extent to which future expenses should be anticipated.

A similar criticism of the method as to future dividends, if the policies are participating, would be more soundly based.

Time-saving Aspects

Against these considerations, however, must be weighed the substantial amount of work saved by not having to deal, for every individual, with the annual cash value increases for each of several policies. Under the method suggested, the insurance data for a member is posted or punched on a valuation card, and employed thereafter, without change, until an additional policy is issued for him. If separate cards are used for each policy, then only the new data must be entered. Either alternative lends itself admirably to mechanization. In contrast, the procedure exemplified in Table 2 for the Unit Credit method becomes very elaborate when insurance increases occur. Even so, its results are not exact. This technique can be adapted to some of the other Clause (C) methods, including at least one that is "self-adjusting," namely the Frozen Initial Liability method.

TAX CONSIDERATIONS

Treasury Regulations permit a pension plan to contain certain supplementary benefits, as long as they remain incidental to the retirement benefits. These include death benefits, but not health and welfare benefits. A line of demarcation between "incidental" and "more than incidental" is difficult to find. However, a widely accepted rule of thumb permits death benefits up to 100 times the anticipated monthly pension. Individual retirement income policies offered by American insurance companies almost universally use this ratio.

It is almost as hard to find anything official as to the treatment permissible for that portion of the deposit to the trustee that goes to pay insurance premiums—or, more properly, for the increase due to the addition of a death benefit. By inference, parallel treatment of the supplementary benefit would be allowed. The citation most nearly in point is probably the following from the pension consultant's bible, the 1945 Bulletin:²

Any method, like one of those indicated above, if it is reasonable in view of all the provisions and circumstances in the case and is followed consistently, may be considered acceptable; but if it appears to result in distortion of net costs or allocation of an unduly large part of them to current years, detailed cost estimates for the benefits actually accruing for individuals may be required.

Certainly the principle illustrated in line 3 of Table 2, of attributing a portion of the insurance to past service, is in keeping with the spirit of the foregoing. It actually reduces the "allocation . . . to current years"; and the prospective formula, preferred by us, does a better job of this than the single-premium approach. This is apparent from the table. The principle has been utilized in a number of approved plans in several jurisdictions.

THEORETICAL ACCURACY

The doctrine of flexibility, advanced at length here, is perhaps more common on the American scene than elsewhere. It is not without its drawbacks. Once the client has been persuaded that, instead of just one right answer as to his cost, there is a range, he is apt to go to the other extreme and assume that it runs from zero to infinity. To set him right, one generally must have recourse to the fundamental axiom of pension funding: that ultimately costs are determined by benefits paid, plus expenses, and less investment earnings, rather than by assumptions or funding methods. Only to the extent that they influence the rate of funding, and hence the investment income, do the latter affect long-range costs.

²See Reference (1), Part III, Sec. H (Cost Effects of Special Provisions), Para. 68.

At the same time, this axiom, while not implying that an actuary is unnecessary in a pension plan, does indicate that elaborate refinements in calculations are not only unnecessary work, but also bemuse the client, and perhaps occasionally the actuary, with a false impression of accuracy. Unfortunately, local Treasury Department representatives sometimes are similarly beguiled. In general, however, the Department recognizes that actual experience will not exactly follow even the most carefully chosen assumptions. In fact, the Regulations prescribe specific treatment for "actuarial" gains or losses resulting from such divergence.

These comments are pertinent, because of the suggested use of methods that involve some approximations.

SUMMARY AND CONCLUSION

A numerical example has been used as the focal point in comparing various alternative funding methods. All of the methods included involve a separation between past service cost and normal cost. A new suggestion has been made for such allocation for a supplementary death benefit attached to a pension plan. This will simplify valuation problems, and give a wider choice as to the amount of tax deduction to be claimed.

Although not discussed herein, an adaptation could readily be made to the case with uninsured death benefits, and perhaps also to split-funding.

Appendix B gives a short-cut for calculating term costs under P.S. 58. This is equally applicable to fully insured plans using individual policies.

APPENDIX A

Formulas Used To Obtain Table 2

Let	x = age at entry into plan
	y = age at which creditable service began
	r = retirement age
	$K = 12 \ddot{a}_r^{(12)}$ = value at retirement age of \$1 of monthly pension for life
	π = gross annual premium per M: Whole Life
	π' = gross annual premium per M: Term to 65
	CV_r = cash value per M at retirement age: Whole Life

In the example:

$$\begin{aligned}
 x &= 35 \\
 y &= 25 \\
 r &= 65 \\
 K &= 132.58008 \\
 \pi &= 21.37 \\
 \pi' &= 12.02
 \end{aligned}$$

$$\begin{aligned}
 CV_r &= 528.29 \\
 D_r/D_x &= .282932 \\
 \ddot{a}_{x:\overline{r-x}|} &= 17.2854 \\
 (N_y - N_x)/(N_y - N_r) &= .458514 \\
 (N_x - N_r)/D_r &= 61.0936 \\
 D_r/(N_y - N_r) &= .00886323
 \end{aligned}$$

The figures were obtained by formulas as shown below:

$$\text{Col. 1, line 1: } 1,875.56 = \frac{x-y}{r-y} \frac{D_r}{D_x} 200K = \frac{D_r}{D_x} 50K$$

$$\text{Col. 1, line 3a: } 2,914.41 = \frac{D_r}{D_x} 50K + 5\pi' \ddot{a}_{x:\overline{r-x}|}$$

$$\text{Col. 1, line 3b: } 2,975.15 = \frac{D_r}{D_x} (50K - 5CV_r) + 5\pi' \ddot{a}_{x:\overline{r-x}|}$$

$$\text{Col. 2, line 1: } 187.56 = \frac{D_r}{D_x} 5K$$

$$\text{Col. 2, line 2a: } 427.96 = \frac{D_r}{D_x} 5K + 20\pi'$$

$$\text{Col. 2, line 2b: } 515.31 = \frac{D_r}{D_x} \left(5K - \frac{20}{30} CV_r \right) + 20\pi'$$

$$\text{Col. 2, line 3a: } 367.86 = \frac{D_r}{D_x} 5K + 15\pi'$$

$$\text{Col. 2, line 3b: } 433.37 = \frac{D_r}{D_x} \left(5K - \frac{15}{30} CV_r \right) + 15\pi'$$

$$\text{Col. 4, line 1: } 3,439.88 = \frac{N_y - N_x}{N_y - N_r} \frac{D_r}{D_x} 200K$$

$$\text{Col. 4, line 3a: } 5,345.18 = \frac{N_y - N_x}{N_y - N_r} \frac{D_r}{D_x} \left(200K + \frac{N_x - N_r}{D_r} 20\pi' \right)$$

$$\text{Col. 4, line 3b: } 5,456.58 = \frac{N_y - N_x}{N_y - N_r} \frac{D_r}{D_x} \left(200K - 20CV_r + \frac{N_x - N_r}{D_r} 20\pi' \right)$$

$$\text{Col. 5, line 1: } 235.02 = \frac{D_r}{N_y - N_r} 200K$$

$$\text{Col. 5, line 3a: } 365.19 = \frac{D_r}{N_y - N_r} \left(200K + \frac{N_x - N_r}{D_r} 20\pi' \right)$$

$$\text{Col. 5, line 3b: } 372.80 = \frac{D_r}{N_y - N_r} \left(200K - 20CV_r + \frac{N_x - N_r}{D_r} 20\pi' \right)$$

APPENDIX B

Term Costs under P.S. 58: A Short-Cut

If death benefits are insured by any type of contract other than group term, and employees do not contribute, the "term cost" portion of the insurance premium, paid by the employer, is deemed to be currently taxable income to the employee. Hence it must be computed annually for each individual and quoted to the employer, in order to be included in the amount reported as total wages for the employee. The Treasury regulation known as P.S. 58 defines a permissible minimum term cost as the product, at attained age, of an amount at risk and a specified one-year term premium. The premiums are actually listed, being based on fairly recent population statistics. The amount at risk may be taken as the face amount less the current cash value.

This puts us right back in the position of dealing with the cash values of several policies for each member. These will increase annually. Nor is this laborious task confined to trustee plans.

There is an elegant way around this difficulty if, as is common, the policies are whole life contracts with cash values determined by the Standard Nonforfeiture Value Method, with a single nonforfeiture factor. Let us define the following symbols, for a policy taken out n years ago on a life then aged x :

- S_x = amount of insurance
- P_x^A = nonforfeiture factor used to determine cash values
- $CV_{x:n}$ = unit cash value at end of n th policy year
- $P'_{y:\overline{1}}$ = one-year term premium at age y . (The prime indicates that the mortality table differs from that used for policy calculations.)
- $T_{x:n}$ = term cost for the n th policy year

Then, by definition,

$$T_{x:n} = S_x (1 - CV_{x:n}) P'_{x+n-1:\overline{1}}, \quad (1)$$

$$CV_{x:n} = A_{x+n} - P_x^A \ddot{a}_{x+n}. \quad (2)$$

Using these, together with the familiar identity,

$$A_y + d \ddot{a}_y = 1, \quad (3)$$

gives us

$$T_{x:n} = S_x (P_x^A + d) P'_{x+n-1:\overline{1}} \ddot{a}_{x+n}. \quad (4)$$

The first portion, $S_x(P_x^A + d)$, does not vary with duration. It can, for instance, be punched on a permanent card at time of issue, together with, say, year of birth. The balance of the right-hand side of (4) depends only on attained age, and could be entered on a set of factor cards. Then it is a simple matter to match by attained age and multiply to obtain the term cost.

As long as the mortality table and interest assumption underlying the cash values do not change, it would not be necessary to keep more than one permanent card for an individual. When a new policy is issued for him, the old figure on the permanent card would be increased by $S_y(P_y^A + d)$, where y is his then attained age.

This is readily extensible to endowment policies as well, by substituting a temporary annuity for the life annuity in (4). If, however, there is more than one normal retirement age, an additional variable is introduced, and some of the simplicity is lost. The deck of factor cards would be enlarged, and its matching with the permanent cards would require sorting on an additional field.

REFERENCES

- (1) U.S. Bureau of Internal Revenue Bulletin of June, 1945, on Section 23 (p) (1) (A) and (B), of the Internal Revenue Code as amended by the Revenue Act of 1942.
- (2) Ray M. Peterson, "Group Annuity Mortality," *TSA*, IV, 246.
- (3) Crocker-Sarason-Straight, *The Actuary's Pension Handbook*, Pension Publications, Los Angeles, Calif., 1955.

**TRANSACTIONS OF SOCIETY OF ACTUARIES
1958 VOL. 10 NO. 26**

DISCUSSION OF PRECEDING PAPER

HERBERT L. FEAY:

The subject of Mr. Rosser's paper is the evaluation of supplementary death benefits in pension plans. He presents a substantially accurate and easily understandable procedure for determining the costs and liabilities for this relatively minor cost item in a pension plan. He then proceeds to a broad statement on theoretical accuracy for pension plan calculations that is not justified by his procedure for this benefit. A similar situation would be to conclude that a broad approximation can be used to determine Ordinary whole life insurance policy reserves because it has been demonstrated that payor benefits issued with those policies can be satisfactorily valued by setting up two-thirds of the annual premiums.

In his discussion of theoretical accuracy, Mr. Rosser indicates that elaborate refinements in calculations for pension plans represent unnecessary work. He also quotes the generalization frequently used to justify broad approximations and unsupported reserve assumptions for pension plans. Even this generalization is not entirely accurate because, for any finite period, there is another factor that affects costs—and we are always dealing with finite periods in making the calculations. The costs are determined not only by benefits paid, expenses paid, and investment earnings secured during a finite period but also by the liability accumulated during that period for benefits payable in the future. The amount of that liability is determined directly by the valuation assumptions and funding methods, and the shorter the period, the greater the importance of this factor on the cost figure. Many pension plan cost calculations are for one year only, without any indication of what future costs will be. The employer and his employees cannot determine from the cost figure for the current year whether future costs will be up or down or remain level.

The employer is in a position comparable to that of an individual who buys a life insurance policy on the basis of a first year premium quotation without knowing whether he has a renewable one year term policy or an endowment at age 65.

The history of life insurance has an illustration of what can happen when the methods and assumptions do not meet the concepts of actuarial soundness. For assessment insurance companies, it was stated that refinements in calculations and extensive actuarial studies were not necessary because future claims, expenses, and interest earnings would determine future costs, and premiums would be adjusted accordingly. There is noth-

ing magical about pension plans that will make that formula work for the average private pension plan where it failed in the life insurance field.

The pension actuary should do much more for his client than quote figures for the current year's tax deduction. The actuary needs to make careful complicated mathematical studies involving a considerable amount of work both when a plan is formulated and periodically thereafter. These studies should be for interest, mortality, withdrawal, disability, retirements, and salary increases. Accurate standards and reliable methods are needed for long-term projections of costs and liabilities. The employer needs a reliable estimate of the future costs for a specified plan regardless of how he proposes to meet those costs. The employee should know if the plan will have the funds available for his pension when he retires and, if not, on what the continuance of his retirement allowance will depend. To me it would be a tragedy for an employee to be given the understanding that the employer was making the necessary payments to a pension plan to assure that employee of a pension, and then find after retirement that the pension cannot be continued because of insufficient funding payments in the past and the unwillingness or inability of the employer to substantially increase future funding payments. Any extensive calculations based on elaborate but accurate methods and standards which may have bemused the employer at the time the plan was adopted will, when that tragedy occurs, no longer lack significance. The fact that the Treasury regulations allow for actuarial losses will not soften the blow.

I suggest that Mr. Rosser probably agrees with much of what I have said, although his comments on accuracy can be interpreted otherwise. The difficulty is that there are many persons responsible for pension calculations who do believe that research and hard work are not necessary for pension plans on the basis of the "fundamental axiom" quoted in the paper.

These people need to read the following and similar references:

- (1) *Concepts of Actuarial Soundness in Pension Plans*, by Dorrance C. Bronson, published by Pension Research Council.
- (2) "The Regulation of Private Pension Plans in the United States," by Ray M. Peterson, published in Volume I of the *Transactions of the XVth International Congress of Actuaries*.

Before closing I do want to compliment Mr. Rosser on the method he has proposed for the supplementary death benefit. Actually his method is at least as accurate as methods I have seen used for evaluation of the main benefit of the plan, namely the pension payments. Mr. Rosser has described a level premium method. He has not ignored this supplementary

benefit and he has not used the one year term assumption as is done for many pension plan valuations for both death and disability benefits. This indicates to me that he is not willing to substitute axioms for work in determining pension plan costs and liabilities.

GEORGE V. STENNES:

It is good to see a subject covered which is of decided interest in pension planning. The problem of death benefits arises in insured and self-insured (trusteed) pension plans alike. It is of particular interest in the change of a pension plan from one method of funding to another. The author has approached the problem from many angles, but to my mind has not arrived at any conclusion or recommendation regarding the most practical answer.

In the paper the author has rambled through various sections headed evolution, government regulations, numerical illustration, single premium method, prospective formula, tax considerations, theoretical accuracy and summary and conclusion.

During evolution he reaches the obvious conclusion that it is impractical to continue full death benefit after retirement and that in his paper he will treat death benefits as secondary to retirement benefits.

It is difficult to see that the discussion on government regulations sheds any particular light on treatment of death benefits.

The sections headed numerical illustrations, single premium method and prospective formula serve only to show how complex a method can be figured out if one puts his mind to it.

Under tax considerations we learn the partial justification of the paper which is to find the greatest flexibility of tax deductibility. The importance of the tax treatment of group one year term seems to have gotten lost even though referred to parenthetically under evolution.

In theoretical accuracy we find proof of the fact that confession is good for the soul.

The conclusion given is difficult to accept since it purports to simplify valuation problems which appear to be introduced through the use of level premium policies in this situation. It would be much easier to start with a simple solution!

The appendix gives a useful and pertinent discussion of a short cut for computing term costs by the attained age method.

In a discussion of "Supplementary Death Benefits in Pension Plans" it seems that a summary of fundamentals may be useful to students and others. Some of these follow:

1. There is no magic in the 100 times pension formula for insurance coverage. On the contrary, more frequently a function of current salary is much more appropriate. The use of "100 times" stems, of course, from the rigidity of the individual retirement endowment contract so often used in the smaller plans, and has no necessary relation to a sound benefit program.
2. Individual policies do not have the flexibility of group insurance. This applies to changes in amount, losses on termination, experience rating, etc.
3. A pension plan, even a contributory one, need have no death benefits if that distinct area of employee benefits is adequately handled elsewhere. This applies both before and after retirement.
4. Any pension plan will have greater flexibility (what an overused word!) if it is stripped of ancillary benefits such as life insurance. A need for adjustments in pensions does not indicate a similar need in the death benefits.
5. The tax advantages uniquely offered by group insurance purchased outside of a trust, particularly in noncontributory plans, can be substantial.
6. In any relatively mature group, the cost of group life expressed as a percentage of salary is quite stable.
7. Last, and perhaps most important: pension plans are basically complicated—particularly to the employer first approaching the problem. Introducing more than one medium of funding (as proposed in the whole life illustration) is muddying the waters unnecessarily. One dubious advantage (not the employer's) may be to so complicate the plan that any later change is impractical.

R. F. LINK:

Mr. Rosser has drawn attention to an interesting and somewhat confusing subject, and his catalogue of problems and methods will be appreciated by consultants and insurance company actuaries dealing with pension problems. The purpose of this discussion is to add, in the interests of completeness, a few footnotes and questions.

The type of death benefit dealt with in the paper is one among several types, and it seems well to expand the list a little. One could mention the following:

- (i) a death benefit based on the projected ultimate pension (Mr. Rosser's illustration);
- (ii) a death benefit representing the pension reserve, such as a return of employer contributions with interest;

- (iii) a death benefit based on current pay and/or accrued service (typical group insurance benefit);
- (iv) a payment of instalments certain as if the employee had retired at or near the date of death under a plan providing for an annuity with a certain period;
- (v) a flat amount multiplied by certain years of service (distinguished from (iii) above by its context, negotiated severance benefits);
- (vi) the whole gamut (and it is wide) of widows' and children's benefits.

Any of the above might serve to fill the gap mentioned by Mr. Rosser. In addition, there are employee contributions which may be returned at death. The funding method to be used in this broader context would seem to depend on the necessities imposed by the particular type of benefit, the funding medium, whether funded death benefit protection in the event of discontinuance is desired, and even the attitude of the employer.

Mr. Rosser concludes that a portion of the cost of death benefits ought logically to be assigned to past service. I am inclined to feel that this decision might properly be based on practical convenience, and that any suggestion that there is a unique theoretically right answer may go too far. Even in Mr. Rosser's extreme example, admitting his observation about limiting cases being included in the theory, the difficulty seems to arise from including as an insurance cost the excess of the single premium over the term cost for one year, rather than from fundamental considerations. What would be done in this case if the accrued liability for pensions had already been funded? Presumably most of the insurance single premium would simply be paid from this fund, and the full term cost might still be called future service.

Mr. Rosser's example leads to several technical observations which follow:

1. If the total past service cost of a plan includes the present value of term or whole life premiums which are actually to be paid as such, then as the past service payments are made it will be necessary to set up as a reserve each year the excess of the contributions for insurance over the premiums actually paid. This is consistent with Mr. Rosser's theory, but may be a nuisance.

2. In Table 2 the past service costs are much the same, whether term or whole life is used. However, the first year normal costs differ considerably, the costs with whole life being higher. In both cases, there is some reflection perhaps of the employee's opportunity to take the cash value or a continued whole life policy at termination, an added plan cost. Some added loading on the whole life plan may enter the picture. In addition, the whole life costs contain a greater level element and a smaller step rate

element. To this degree, the figures are confusing and would need careful interpretation to an employer. The true difference is not so great as it seems.

3. Mr. Rosser suggests dividing the benefit into parts under the entry age normal cost method by a ratio derived from that method. One other logical approach is to calculate normal cost as if the plan had always been in operation and insurance premiums had been paid from the entry of all present members. Under this method, the past service liability becomes the difference between the present value of future normal cost payments and the present value of all future insurance premiums and additional pension benefits not provided by insurance premiums. This approach flows nicely into the frozen initial liability method. It sets the normal cost higher (at the theoretically ultimate level) and gives credit in past service costs for the insurance protection which was not granted in the past. In the term cost illustration, this gives a normal cost for the death benefit of \$189.60 and an accrued liability of \$878.10 (estimated) as against Mr. Rosser's figures of \$130.17 and \$1,905.30 in Table 2 (obtained by subtraction).

4. To carry the foregoing thought a step further, suppose that it were desired to pay true term costs based on the actual ages each year (thus avoiding reserve questions, implications of funding death benefits, etc.). Then it would seem appropriate to consider the entire term cost as normal cost, even though a portion of the benefit is associated with past service annuities. To do otherwise, classifying a portion of the cost as past service, would result in a confusing apparent understatement of the "going level" of costs under the plan, because future entrants would have the same (or more) insurance protection, and it would all be normal cost.

Mr. Rosser states that to carry forward the unit credit cost illustration for later years "would simply be to illustrate the familiar rising-cost tendency of the Unit Credit method." I assume he means that it would illustrate how the individual present value factors increase with age, rather than how total costs rise under the unit credit cost method. It is not applicable to the latter question. There is a tendency to point to the rising rates of the unit credit cost method and then to state, as an accepted, self-evident fact, that this is why the annual costs go up. Rising rates may be a contributing factor, but they certainly are not the only one or the most important one.

Probably the single most important factor in rising costs under the unit credit cost method is that more annuities are being bought or accrued as a result of inflation and an expanding group. To the extent that cost as a percentage of total payroll rises, this could be due to the fact that a larger

portion of the total payroll is related to covered employees as the group matures; also to rising average age and changing rates. In integrated plans, the benefits as a percentage of covered payroll may rise because the Social Security offset has less effect as average salaries rise. These rising cost effects can also be observed under the entry age normal cost method, particularly if eligibility requirements are used to limit the funding group.

Mr. Rosser refers to the difficulty of explaining to a client that the accrued liability may be a function of a particular funding method, rather than of the benefits based on accrued service, and suggests that it is usually unimportant to make the distinction. One might feel that, if any confusion is likely on this score, it is vital to have a client understand to what degree his arrangements, including the funding method, are likely to produce a fund sufficient for promised or accrued benefits in the event of discontinuance. Admittedly, this ideal is sometimes difficult to achieve in practice.

SAMUEL N. AIN

The author proposes a novel method of taking what is basically a Section 404(a)(1)(B) method of funding the death benefits and cash values of a typical auxiliary trust pension plan and forcing it into a Clause (C) funding method, resulting in higher limitations on deductions.

There appear to be some subordinate technical inconsistencies in the development. For example, to be consistent with Col. 1, line 3*b* of Table 2, Col. 2, line 3*b* should be $\frac{2}{4} \frac{0}{0} \pi \ddot{a}_{x:\overline{r-x}}$ or \$184.69 rather than \$320.55. There is a similar question with columns 1 and 2 of line 3*a*. Furthermore, there is the question of dividends that would have accrued with respect to that part of participating policies assigned to past service.

More generally, if the method proposed were acceptable in the case discussed involving ordinary life contracts, presumably it would be equally acceptable in the case of retirement income and retirement annuity contracts. Also, in the latter case the actuary, by trial and error, could determine whether the limitations should be "better" determined by using ratios of annuities certain rather than ratios of temporary life annuities.

In discussing the acceptability of his proposal, the author finds support in the third paragraph of Part III Section H of the Bulletin on Section 23(p)(1)(A) and (B) which he interprets as approving any method of allocating costs between past and future as long as it keeps the normal cost low enough. The same interpretation would support calling all costs "past service costs," reducing normal cost to zero and substantially simplifying the problem.

However, we do not need to look to the 1945 Bulletin to find whether the method proposed measures up to Internal Revenue requirements.

Section 1.404(a)-3(b) of the Regulations provides in part: "In no event shall costs for the purpose of section 404(a)(1) exceed costs based on assumptions and methods which are reasonable in view of . . . the funding medium. . . ." Also, Section 1.404(a)-6(b) which discusses clause (C) funding and limitations provides that in any case the method must be "reasonable in view of the provisions and coverage of the plan, the funding medium, and other applicable considerations." Since the proposed formulas are not consistent with the funding medium, presumably they could be used without criticism by the Internal Revenue Service only if they resulted in lower limitations than under more obvious, natural and simply applied methods.

(AUTHOR'S REVIEW OF DISCUSSION)

HARWOOD ROSSER:

It was my expectation that a paper which straddled controversial issues would elicit a variety of reactions. It did. One of the discussants went somewhat afield to make a thinly veiled plea for more supervision of pension plans. Two of them felt that simpler approaches were available, and one of these was specific. A fourth reviewer most gratifyingly brought out several practical aspects of the subject, as well as some alternative viewpoints.

Mr. Feay's long departmental experience probably predisposes him to pass lightly over such differences in situation between insurance companies and private employers as the following:

1. Employers who set up noncontributory pension plans, often voluntarily, are not "vested with a public interest" to the same extent as are insurance companies. The latter accept money from all comers in exchange for future benefits. Even in a contributory plan, the employer is not the ultimate recipient of employee contributions, but merely a collection agency, as in the case of withholding taxes or union dues.
2. For an insurance company, higher reserves than necessary may result in temporary embarrassment, due to the drain on surplus. But they seldom cause any permanent damage. In a negotiated pension plan, however, accelerated funding may evoke increased union demands.
3. An insurance company has virtually no recourse against unreasonable demands by an insurance department, either as to standards or as to volume of detail required. But a consultant can always be dismissed if either his cost figures or his fees look too high to his client.

Mr. Feay has imputed to me some conclusions that I certainly never intended to suggest. For example, I said, in effect: "Because elaborate refinements are unjustified in most pension work, some degree of approximation is permissible for a minor benefit." But he understands me to say instead: "*Since* the degree of error in my proposal for a minor benefit is small" (a matter which I did not even determine), "elaborate refinements are unnecessary for major benefits."

He cites the failure of assessment insurance in order to indicate the need of extensive actuarial studies in private pension plans. But this overlooks the open invitation to antiselection implicit in the former. After all, why should a young man join an assessment plan? But in a pension plan, there is usually little opportunity to select against the fund, especially through delayed entry.

All this is not meant to advocate taking figures out of a hat. Nor would I quote one-year cost figures out of context. At the same time, ten pages of figures are not ten times as convincing as one page.

Mr. Stennes is a staunch advocate of group term. Its merits were conceded in the paper. But what would he recommend for the small employer who cannot qualify for group? His employees need pensions and death benefits just as much as those of a giant corporation. He himself needs the flexibility of a "Clause (C)" funding method, along with his larger competitor. A realization of this need has led to pooled trust funds. But these do not solve the death benefit problem for the small employer. The solution, however, should not limit him to a "Clause (B)" approach for his entire fund, *i.e.*, a fixed commitment each year. Or would Mr. Stennes prefer the latter to the use of "more than one medium of funding," which he condemns?

There is one thing in the paper—Appendix B—for which Mr. Stennes has a kind word. Ironically enough, it is inapplicable if group term is used!

In view of his background, it is regrettable that Mr. Ain strikes an attitude reminiscent of the Bureau. He objects, "This is not the way to salvation." However, little guidance is offered for straying souls. He pronounces the proposed formulas "not consistent with the funding medium." But he mentions no criteria for consistency, as the motto of the Society might suggest.

On what he calls "technical inconsistencies" in his second paragraph, he does get down to particulars. For the Unit Credit method, he proposes a substitute formula for normal cost. Under his system, the normal cost, including a portion of the original insurance premium, would at every attained age remain proportional to the normal cost excluding this item. It would start lower and wind up higher than mine.

From a purely theoretical viewpoint, it is immaterial whether benefits are paid for by level, increasing or haphazard contributions, as long as funding is complete before any benefits fall due. Otherwise, obvious precautions must be taken. By extending the Unit Credit pattern to the future service portion of insurance premiums included in the normal costs, Mr. Ain has achieved a nominal consistency. However, since these premiums fall due annually, his approach is more apt than mine to encounter practical difficulties. Thus, in line 3*b*, he would obtain a total normal cost, \$297.52, and a "safe" minimum deposit, \$386.77, both smaller than the insurance premium payable, \$427.40. This can be troublesome to explain to a client, and perhaps to a trust officer as well.

For a man with no past service at plan inception, it is an "obvious, natural and simply applied" method to add the insurance premium to the normal cost obtained for the benefits not provided by insurance. This would seem to be so, whether the remaining normal cost is figured on a single premium, level cost or some other basis. The formulas taking account of past service should include the above result as a special case, *i.e.*, when x equals y . My formulas, on both sides of Table 2, meet this simple test. Mr. Ain's proposal does not. This accounts in part for the incongruous results in the preceding paragraph.

Finally, the slightly greater computational simplicity of his method disappears as soon as an additional policy is issued on the individual.

Surprisingly, the most sympathetic reaction came from the only insurance company representative, Mr. Link. I agree that practical considerations should influence the extent of the recognition of death benefits in the past service liability. Nor would I claim to have "a unique theoretically right answer."

In his first "technical observation," Mr. Link seems to take an unnecessarily complicated view of the liabilities to be set up. The reserves held by the insurance company on any policy will be unaffected by the existence of the trust fund. For the trustee portion, the accrued liability is not related to the progress of the funding (although, of course, the unfunded portion is), but is determined by formula. Several formulas for the liability at plan inception are given in Appendix A.

For the case in line 2*b* or 3*b*, on either side of Table 2, successive liabilities are related by the equation

$${}_{n+1}V = \frac{D_{x+n}}{D_{x+n+1}} ({}_nV + NC_{x+n} - 20\pi), \quad (5)$$

where ${}_nV$ is the accrued liability n years after inception, and NC_{x+n} is the normal cost due at that time. This will be recognized as a Fackler-

type formula, adjusted for the fact that the insurance premium is paid annually through the trust fund. Any "excess of the contributions for insurance over the premiums actually paid" will be reflected in the assets of the trust fund, rather than in the liabilities. This is also true of any deficit, such as might arise if business conditions necessitated the reduction or elimination of the year's contribution.

Two paragraphs later, Mr. Link offers a logical alternative formula. The derivation of his two figures may not be too clear. His \$189.60 is simply the Term to 65 premium at age 25. The \$878.10 results from differencing such premiums at ages 25 and 35, and multiplying by a temporary annuity from age 35 to age 65. Thus it is practically a premium deficiency reserve, set up because future normal costs include the age 25 premium, whereas the larger one at age 35 must be paid.

Mr. Link seems to feel more comfortable about assigning part of the investment, or savings, element of an insurance premium to prior service than about doing the same for the term, or protection, portion. There is some logic to this position. For the employee who dies before plan inception, past service has failed to provide any benefit at all. In general, a pension plan favors survivors. But it might seem to do so unduly if it provides, for another employee, not only a pension benefit, but also a death benefit, both carrying a past service label.

Of course, if there is any inequity, it will take more than changing the label, or even the funding method, to eliminate it. Conversely, an alteration in funding arrangements will not, of itself, create an injustice. The chief merit of treating the investment and the protection elements alike, by dealing with the total insurance premium, as I have done, is its relative simplicity.

Where the size of the case and other considerations permit, there are advantages, as both Messrs. Link and Stennes suggest, in defining the death benefit without reference to the pension formula. For one thing, the somewhat academic questions encountered above may then be avoided.

Finally, Mr. Link gives an excellent check-list for the actuary who is asked to explain rising costs in a pension plan.

It is manifest that my reviewers and I do not see eye-to-eye on many points. Nevertheless I am deeply appreciative of their comments. After all, it takes more effort to say, "Now, just a minute! . . ." than it does either to sit in the amen corner or to utter a silent "So what?" Unanimity of opinion on such a subject is hardly to be expected; but the exchange of opinions has, I hope, shed considerable light on it.