4. Actuarial Issues

4.1 Comparison of DROP vs. Regular Deferred Retirement Benefit

Figure 4.1 provides an example of a DROP benefit. This assumes that an employee hired at age 25 can retire at age 50 with a retirement benefit of $28,103/year. The annuity benefit is "frozen[1]" at $28,103/year. The employee begins to accumulate a lump-sum DROP account balance. In our example, the DROP account balance equals the accumulation of the $28,103/year pension (plus COLAs) plus the six percent of pay employee contributions plus interest at six percent. In this example the benefit at age 55 would be:

- an annuity of $44,076/year under the current plan (requiring a reserve of $609,713) or
- an annuity of $32,580/year plus a lump sum of $192,456 if DROP were elected.

Appendix B contains additional details on how the numbers in figure 4.1 were calculated. These details are important when writing plan provisions.

[1] Frozen may not be the correct term if COLA adjustments are provided while in the DROP.

Figure 4.1

The DROP Choice–Five-Year DROP

	Age		Current Annuity	vs.	Proposed Annuity	+	Proposed Lump Sum	Value of DROP vs. Current Benefit
NRA =	50		$ 28,103		$ 28,103		$ -	
		or	$ 423,566		$ 423,566		$ -	**100.0%**
	51		30,835		28,947		32,114	
		or	$ 457,495		$ 429,475		$ 32,114	**100.9%**
	52		33,782		29,815		67,196	
		or	$ 493,080		$ 435,175		$ 67,196	**101.9%**
	53		36,960		30,709		105,460	
		or	$ 530,324		$ 440,634		$ 105,460	**103.0%**
	54		40,386		31,631		147,132	
		or	$ 569,212		$ 445,816		$ 147,132	**104.2%**
	55		44,076		32,580		192,456	
		or	$ 609,713		$ 450,680		$ 192,456	**105.5%**

Assumptions: 8% Interest, 5.5% Salary Scale, 3% COLA, 83 GAM male mortality
6% Interest on DROP balance and contributions.

From the above we can observe that the DROP benefit is more valuable than the non-DROP benefit. Later we will cover under what conditions this relationship is reversed. However the initial point we want to make here is that a DROP benefit is usually more valuable than the regular delayed retirement benefit if the DROP is designed to preserve the value of the NRA benefit. After five years of DROP participation, the ratio of the present value of the benefits is 105.5%. It is not uncommon to see ratios after five years of over 110%. Generally the ratio increases the longer the DROP participation period. Throughout the rest of this report we will refer to these ratios (e.g., 105.5%) as the "**DROP ratio**".

The second point to remember is that the DROP benefit in the illustration is by definition of equal value to the benefit earned at NRA[2]. Therefore, it would also be fair to say that the non-DROP benefit loses 5.5 percent of its value if an employee continues to work beyond NRA. Consider that the present value of the non-DROP age 50 benefit of $423,566 with eight percent interest for five years would grow to $622,357; yet the immediate present value of the age 55 non-DROP annuity is only $609,713 and even that required post-age-50 employee contributions to continue.

As was mentioned at the beginning of the report, reasonable people will have very different perspectives on DROP benefits. Some of the arguments we have heard related to the above comparison are covered in the following two bullets. Keep in mind that these are advocacy statements and are not intended to be balanced.

- **Anti-DROP perspective:** The relatively young retirement ages for public safety employees are not really NRAs but heavily subsidized unreduced early retirement ages. DROPs are a way of preserving these early retirement subsidies for an employee who continues to work, and therefore should not be entitled to receive them.

- **Pro-DROP perspective:** The DROP benefit is free since it is no more valuable than the benefit which the employee is already entitled to receive provided he leaves and stops getting paid. This argument would only apply to a forward DROP.

Like the question "Is a DROP participant active or retired?" both perspectives have an element of truth but are more political arguments than actuarial or plan cost arguments. Actuaries need to be aware of both perspectives.

4.2 Trading Annuity Benefits for Lump Sums

Figure 4.1 illustrates that the DROP benefit consists of a trade-off of an annuity benefit for a lump-sum benefit. To compare benefits on an apples-to-apples basis we chose to convert all benefits to lump-sum present values at date of termination. We could have converted all benefits to annuities. Keep in mind

[2] Different treatments of employee contributions can affect this conclusion and are discussed later in this report.

that employees, when given the choice, will generally elect a lump sum rather than an annuity, but in either case the ratio (e.g., 105.5%) would be unchanged.

One question the actuary must ask is, "what impacts this trade-off?" This can be broken down into: (1) what is the future rate of benefit accruals under the pre-DROP plan? and (2) how valuable is one dollar of annuity?

(1) The rate of future benefit accruals is a function of the following:

The plan-specific formula:

Assume two plans both have a "20 and out" provision with a benefit of 50% of final average pay after 20 years. Assume one continues accruals at 2.5 percent per year after 20 years while the second plan lowers the accrual rate to two percent after 20 years. Assume members of both plans can elect DROP after 20 years of service. All other things being equal, the DROP benefit ratio will be higher for the second plan since employees forfeit less annuity benefit to get the same DROP lump sum.

Rate of pay increases:

Most plans with DROPs are final average pay plans. When the DROP annuity is frozen, the amount of the forgone annuity increase depends partly on future increases in pay and final average pay.

(2) The value of one dollar of annuity is a function of the following:

Does the plan provide a COLA and what is the COLA provision[3]?

What is the interest assumption being used by the actuary and what is being used by the employee in making the decision?

What is the mortality assumption or life expectancy (i.e., mortality table and age) used by the actuary and what is being used by the employee in making the decision?

[3] We use the word "provision" versus "assumption" just to emphasize that the ultimate cost is based on provisions and experience and not assumptions.

These points are discussed again in Section 4.7.

4.3 When Does Funding End?

One of the first questions asked in this study was whether a DROP participant should be viewed as an active employee or a retiree. In the funding sense the question is whether funding (i.e., normal cost) should end when a participant elects DROP[4] or later when the participant stops working. ASOP #4 says:

> The period over which the allocation is made for an individual should begin no earlier than the date of employment and not substantially later than the date of entry into the plan (e.g., completion of one year of service and attainment of age 21) and should not extend beyond the last assumed retirement age. Normally, the period of allocation should not end before the end of the period during which the participant is accruing a benefit under the plan. The period could be on an individual or group basis.

GASB statements focus on funding to an "exit age." FASB has cost attribution rules (FAS87 paragraph 40) that are based on the pattern of benefit accruals and not their present value.

DROP plans have been valued two different ways: normal cost ending when a participant elects DROP or later when the participant stops working. Ending normal cost earlier often raises the short-term cost. In situations where the DROP ratio is above 100% and prior retirement rates extended beyond NRD, it would seem incongruous to accelerate funding because of the addition of a DROP benefit that adds extra benefits for those who work beyond NRD.

Non-actuaries often think that the way DROPs "save money" is that employer funding can end when a participant elects DROP. It is often difficult to explain that current funding requirements are less the longer time there is to fund the benefit.

The issue of when funding ends is only a material issue when employees are assumed to work many years beyond NRD. Retirement rates might produce average years worked beyond NRD in the following ranges: police officers: 1-4

[4]This could refer to both (i) treating DROP participants as retirees and (ii) anticipating an earlier end of normal cost for those expected to elect DROP in the future.

years, firefighters: 2-8 years, other public and private sector employees: 0-3 years. Therefore, this issue would have the biggest impact for firefighters.

Notwithstanding our comment about later retirement ages, some actuaries and plan sponsors believe that normal cost should end at the beginning of the DROP participation period. Section 4.13 deals with techniques used under both approaches.

The topic of when does funding end also leads to a discussion of what does "cost neutral" mean. We refer the reader to approaches 1 and 2 in Section 4.7 and Section 7.1.

4.4 Significance of Retirement Rates

As this is our first section discussing the actuarial assumptions used to measure the cost of DROP, we would like to point out the fact that actuaries cannot change the cost of DROP (any more than they can change the cost of the entire plan) by changing assumptions or methods. Assumptions and methods are just tools to estimate and allocate plan cost.

Determining plan "cost" is more than just an exercise of determining whether the "DROP ratio" is less than or greater than 100%. A central question is whether having a DROP will impact retirement rates. As is generally true with traditional plan formulas, the longer a person works beyond NRD the lower the plan's cost to the employer. This occurs because: (1) payment begins at a later age, (2) the annuity is paid over a shorter lifetime and (3) there is more time to fund the benefit.

The maximum cost almost always occurs if a participant retires when first eligible. This is important to keep in mind for the following reason: a participant electing DROP is generally getting the same benefit as the "actuarially most valuable" benefit available but receiving payment (plus interest) at a later date.

Many plans have retirement rates that assume some participants retire after NRA. It would not be unusual in a public safety plan to assume 20% retire at NRA, and that on average participants who work past NRD will work an average of four to five additional years.

The actuary determining the cost of DROP may need to decide how adding a DROP feature will affect retirement rates. DROP is often seen as an

encouragement to work beyond NRD. However, DROP designs that include a mandatory retirement provision after a fixed DROP period will limit service. We have collected some actual DROP experience (see Section 4.10 below); however, it needs to be understood that experience is a function of specific DROP design and the employee group covered. Collecting experience and deciding to what extent different factors affected experience is an area that needs further study.

If the valuation actuary assumes that retirement rates are not impacted by the addition of a DROP feature, the DROP ratios and "survival rates" will determine plan cost. A simple review of the following can help produce a rough cost estimate:

Figure 4.2

(1) Age	(2) Assumed retirement rates	(3) ${}_tp_x$	(4) DROP ratio	(5) Weighted DROP ratio = (2) x (3) x (4)
NRA (t=0)	40.0%	100.0%	100.0%	40.0%
NRA + 1 (t=1)	10.0%	60.0%	100.9%	6.1%
NRA + 2	10.0%	54.0%	101.9%	5.5%
NRA + 3	10.0%	48.6%	103.0%	5.0%
NRA + 4	10.0%	43.7%	104.2%	4.6%
NRA + 5	100.0%	39.4%	105.5%	41.5%
			Total =	102.64%

Later we will bring more factors into the calculation (e.g., mortality and other pre-retirement decrements). However, we would expect the value of benefits associated with the retirement decrement[5] to increase by about 2.64 percent in this example (Note: this is based on example one in Appendix B where the actual increase in the present value of benefits (PVB) was 2.62 percent after factoring in annuity factors and benefit accruals, etc.).

Adding a DROP feature may extend the average participant's service. When this occurs we would expect the 102.64% ratio to increase. However, there is no easy way to determine the impact without a full valuation because it is difficult to determine the impact of extending the funding period. This will be illustrated below.

[5] Assuming no early retirement benefit or decrement.

There is also a special group of employees who should be considered—the group who is already beyond their NRD when the DROP feature is first added to the plan. They may have a longer or shorter expected future working lifetime than a participant just at his or her NRD. In addition, their DROP ratio tends to be higher because they are older (i.e., a dollar of annuity is not worth as much in the trade-off for the DROP lump sum). Perhaps most important for this group is that there can be a material increase in normal cost if they are no longer expected to retire immediately. (See the comparison of examples one and two in Appendix B.)

Should the actuary assume that adding a DROP will delay when participants retire?

Some have assumed that adding a DROP will change the actual retirement pattern, or more specifically, it will cause plan participants to alter the plan's experience by delaying their retirement. Caution (some would say extreme caution) should be observed in following this approach when estimating the cost impact of adopting a new DROP. There is very little definitive statistical evidence on the impact DROPs have in this area. In addition, the authors think that the impact will be materially influenced by: (1) the pre-DROP design, (2) the DROP design and (3) the type of group covered (i.e., police vs. fire vs. general employees or teachers). If the plan actuary assumes that there will be a favorable delay in retirement patterns after the adoption of a DROP and that assumption becomes a key in the decision to adopt the DROP, there may be significant problems for the plan's trustees and for the actuary if actual experience does not meet this expectation and as a result, actual costs are higher than originally estimated by the actuary. If there is a savings associated with the assumed delayed retirement age, the actuary might want to separately quantify that amount for the trustees.

The plan's actuary may believe it is more prudent to assume no change in the plan's retirement patterns when the DROP benefit is being considered. If favorable changes in retirement patterns do, in fact, occur after DROP is implemented, then actual costs will be less than estimated by the actuary, and contribution rates can then be adjusted downward. It is always better to have favorable variations after the implementation of a new benefit structure than to have unfavorable variations. While we believe this to be a natural desire of the plan actuary, it may be challenged by the "union's" actuary in a labor negotiation setting as not being the best judgment. Adding a sunset provision could limit the problem should experience be less favorable than the assumption.

If the DROP design itself includes some feature that penalizes the DROP participant if he or she does not stay in DROP a certain period of time, then it might be appropriate to assume some favorable change in retirement rates when doing the original cost estimates. An example might be where the member who elects DROP must stay in DROP a certain number of years before becoming eligible for a COLA. In this situation, it might be acceptable to assume that those employees who enter DROP will have a zero percent probability of retirement until they satisfy that requirement. Likewise, if a DROP requires an employee to retire after five years, the actuary should not assume that if a participant elects DROP they will stay for six years.

Police officers vs. Firefighters

As was mentioned earlier, firefighters tend to work longer after NRD than police officers. It would not be unusual for a significant percentage of a firefighter work force to be beyond NRD.

Public safety vs. Non-public safety

Compared to public safety employees, non-public safety employees have later NRDs, fewer work to their NRD and actuaries often assume fewer work past NRD. DROP ratios tend to be higher (due to age) for non-public safety employees. This is related to the fact that actuarial increases are greater at older ages. DROPs provide a type of actuarial increases while most non-DROP post-NRD accruals provide less (depending in part on the formula, the rate of pay increases and the length of service).

4.5 Treatment of Employee Contributions

There are three common treatments of employee contributions in DROP designs: (1) discontinue employee contributions, (2) continue contributions and add them to the DROP lump-sum account and (3) continue contributions but do not add them to the DROP lump-sum account.

Generally the first two options are roughly of equal value. There may be some difference between the interest assumption (interest lost on contributions not made) and the interest credited on contributions to the DROP account.

The third option is a lower cost option. This may be used to lower the cost of a DROP and should be factored into any DROP illustration (including the

DROP ratio). From an employee's perspective, this option will not seem fair. However, many will point out that since the DROP is an option, employees have the choice not to elect the DROP if they think the provisions are inequitable.

Some funding methods determine a gross normal cost and the employer normal cost equals the gross normal cost less the expected employee contributions (sometimes reduced for current year decrements). The issue here, under the first option, is that the gross normal cost might be level over a participant's employment but the employee normal cost will decrease and the employer normal cost will increase. This is not unique to DROPs and is discussed again in Section 4.6.

Some aggregate funding methods use the present value of future employee contributions as an offset to determine the present value of future employer normal cost. These are probably the easiest situations in which to handle all three options listed above. The present value of future employee contributions does not change under the second and third options and is reduced under the first option.

4.6 DROP Cost Discussion and Illustration

Figuring out how to determine the cost of a DROP can be difficult. Part of this difficulty can be linked to limitations of valuation software. This is particularly true with parameter-driven systems. Few, if any, currently have built-in parameters for DROP plans as they do for cash balance or career average pay plans. Variations in DROP designs related to the treatment of employee contributions and ancillary benefits during the DROP participation period also require attention. The following are some observations that may be helpful. To help make this somewhat less abstract, we have also included a discussion of the "sample life" illustrations that are contained in Appendix B.

The retirement assumption is that 100% of members retire at NRA and participants cannot elect DROP until that age. If this were the assumption both before and after the addition of the DROP feature, there would be no change in the immediate valuation result due to DROP. Any participant who elected to continue to work beyond NRA would likely generate what some would perceive to be an actuarial gain[6], either with or without electing DROP. Similarly, if the

[6] The "gain" under DROP might simply be no additional pension cost for that year of service. See discussion in Section 4.4.

assumption prior to the addition of a DROP feature was that 100% of participants retired at NRD and after the DROP that some employees will work past NRD, the immediate impact would be to reduce the current employer contribution rate. This might not be an uncommon situation where NRA is age 65. However, in public sector police and fire plans it is likely that NRA is well below age 65 and the plan already assumes that many (if not most) employees work beyond NRA.

Now assume the following:

1. The retirement assumption both prior to and after the addition of the DROP feature is that 100% of members retire three years after NRA.

2. Participants can elect a DROP only at NRD and all do make that election.

3. The DROP participation period will be exactly three years.

4. There are no ancillary benefits after NRD.

5. Employee contributions continue during the DROP participation period.

If under these conditions the DROP ratio at the end of the three-year DROP participation period equals 100%, there is no change in the employer's contribution rate. If the DROP ratio is above 100%, the contribution rate will increase and if it is below 100% the contribution rate will decrease. However, considerations should be given to deviations in all of the assumptions listed above. Below is a discussion of each of the following:

If DROP increases (or decreases) that amount of time worked beyond NRD, how will that affect plan cost?

What happens if participants delay DROP elections beyond NRD (particularly those already beyond NRD when the DROP feature is first added)?

How is the DROP cost impacted by the presence or absence of employee contributions during the DROP period?

If DROP increases (or decreases) the amount of time worked beyond NRD, how will that affect plan cost?

As a general rule, any increase in time worked beyond NRD will lower the employer contribution rate due to shortening the time over which the annuity is paid and increasing the time over which to fund the benefit. If the addition of a DROP is expected to lengthen the time worked after NRD, the contribution rate of the plan can go down even if the DROP ratio always exceeds 100%. Conversely, the contribution rate goes up if the length of time worked after NRD is expected to go down. This result is often the immediate impact in situations when a decision is made to end normal cost at NRA or at the beginning of the DROP participation period. See prior discussion in Section 4.4.

What happens if participants delay DROP elections beyond NRD (particularly those already beyond NRD when the DROP feature is first added)?

DROP ratios tend to be higher at later ages. Keep in mind that electing a DROP is often seen as trading a reduced annuity for a lump sum. As was discussed earlier, the value of the annuity is a function of several things including age. At older ages the value of the annuity given up is less. Therefore DROPs are more expensive (as measured by the DROP ratio) at older ages.

When looking to add a DROP feature, particular attention should be given to employees already beyond NRD. There are three reasons for this:

1. They will tend to have a higher DROP ratio than younger employees who are likely to make a future DROP election closer to NRD.

2. The plan's assumed retirement rates may be lower at their current age than it was at NRA. As a result, the pre-DROP expected future working lifetime of an employee at age NRA+1 might be more than for an employee at NRA. If all DROP participants are assumed to retire after a fixed period (e.g., three years), this could result in shortening the expected working lifetime for older employees but not younger employees.

3. Consideration should be given to the impact on the allocation between normal cost and actuarial liability. For employees at or beyond NRD when a DROP is added, their immediate retirement probability will decrease. This will often increase normal cost (since

there is no normal cost for the percent assumed to leave immediately). While the Actuarial Liability will often decrease when retirement rates decline, the impact on the current contribution will depend on the funding method and amortization period. If there is a significant portion of active participants beyond NRD (as may occur in a plan covering firefighters), the results can be material. This is illustrated in Appendix B.

How is the DROP cost impacted by the presence or absence of employee contributions during the DROP period?

Section 4.5 discussed different treatments of employee contributions during the DROP participation period. Often how the employer normal cost is adjusted for employee contributions[7] and how the valuation software should be coded require extra attention.

Care needs to be taken when employee contributions stop. Two common examples in which the employee contributions are discontinued prior to termination of employment include: (1) certain DROP designs and (2) when maximum accrual "rates" are achieved in a non-DROP design, e.g., 80% of pay after 30 years. Some funding methods will level out the employee contribution offset over an employee's entire career while others will only apply the offset in years when the employee contributions are made. This may be done internally by the valuation software after the software calculates the gross normal cost.

In situations where the employee contributions stop, it may be appropriate to determine the DROP ratio by including in the numerator (which represents the DROP benefit) the value of discontinued employee contributions with interest at the valuation interest rate and adjust for salary increases during the DROP period. Often this modified DROP ratio can be used as a loading factor to estimate the cost of a DROP benefit. Also see Section 4.13.

Sample Life Illustrations:

We want to show the impact of DROPs on plan cost, normal cost, actuarial liability and present value of benefits. For ease of illustration, our base-line case is an employee just reaching NRA and the funding method is PUC. We selected PUC and not entry age normal since PUC does not require using benefits and

[7] The employee contribution offset is often reduced for decrements during the current year.

decrements prior to the valuation date. Details of plan provisions, data and assumptions are shown in Appendix B.

Example 1 in Appendix B shows the following input and results for a pre-DROP valuation:

Age = NRA = 50
Service = 25 years
Expected future service = 2.5 years
Interest/salary scale/COLA/interest credit assumptions = 8%/5.5%/3%/NA
PVB = $419,784
Employer normal cost = $6,830 (13.66% of pay)
Actuarial liability = $385,174

Example 1 in Appendix B also shows the following input and results for a post-DROP valuation. The illustration assumes every participant elects DROP at NRD and uses the same retirement rates as in figure B.1. The illustration assumes the employee contributions continue during the DROP participation period and are added to the DROP account.

Age = NRA = 50
Service = 25 years
Expected future service = 2.5 years
Interest/salary scale/COLA/interest credit assumptions = 8%/NA/3%/6%
DROP ratio at age 55 = 105.5%
PVB = $ 430,768 (2.62% increase)
Employer normal cost = $7,201 (5.4% increase)
Actuarial liability = $394,454 (2.4% increase)
(Change in normal cost + 20-year amortization of change in actuarial liability)/pay = 2.49% of pay

It should not be surprising that the PVB increased by some amount between the DROP ratio at age 50 and age 55 (less 100%).

In Example 2 in Appendix B we modified the retirement rates after age 50 and assumed employees would work slightly longer with the addition of the DROP. The average expected future service increased from 2.5 years to 2.7 years.

The results compared to the non-DROP were as follow:

Age = NRA = 50
Service = 25 years
Expected future service = 2.7 years
Interest/salary scale/COLA/interest credit assumptions = 8%/NA/3%/6%
DROP ratio at age 55 = 105.5%
PVB = $ 431,489 (2.79% increase)
Employer normal cost = $7,086 (3.7% increase)
Actuarial liability = $391,569 (1.7% increase)
(Change in normal cost + 20-year amortization of change in actuarial liability)/pay = 1.72% of pay

It is interesting to see the small change in expect future service having such a material impact on the cost of the benefit change.

We have varied the above illustrations to show the impact of items discussed earlier. However, due to space limitations we have not included all of the detailed illustrations in the appendix. We are comparing the above cost (i.e., 2.49% of pay) to a revised amount.

Contribution rate using a 9% valuation interest assumption =	3.63%
Contribution rate using an 8% baseline valuation interest assumption =	2.49%
Contribution rate change (as a percentage of pay) =	1.14%

Contribution rate using a 0% valuation COLA assumption =	1.24%
Contribution rate using a 3% baseline valuation COLA assumption =	2.49%
Contribution rate change =	(1.25%)

Contribution rate using a 4.0% valuation salary assumption =	5.80%
Contribution rate using a 5.5% baseline valuation salary assumption =	2.49%
Contribution rate change =	3.31%

Contribution rate using an 8% interest credit assumption =	3.17%
Contribution rate using baseline 6% interest credit assumption =	2.49%
Contribution rate change =	0.68%

Contribution rate if employee contributions cease during DROP period =	4.61%
Contribution rate if employee contributions continue during DROP period =	2.49%
Contribution rate change =	2.12%

We also looked at assuming 100% retire at NRD. In the sample life the PVB increased slightly, the normal cost became zero and the actuarial liability increased materially (to the level of the PVB). While the normal cost might become zero for someone expected to now retire immediately, the normal cost (and actuarial liability) for younger employees would likely increase materially. A material increase is likely in the overall plan contribution rate (the extent is likely dependent on the amortization method and period used).

4.7 Pre-DROP Assumptions

One of the more interesting things about determining the cost of a DROP proposal is to realize the significance of the pre-DROP plan assumptions. An actuary could have two plans with identical plan provisions and identical DROP proposals and for one plan the actuary could determine a material cost to add a DROP feature and for the other a material savings. This can be easily understood if one plan assumed (before the addition of a DROP feature) that 100% of participants retired at NRD and the other assumed employees worked far past NRD.

Below is a discussion of how to determine the cost of DROP. The points we want to make in this section focus on the existing (pre-DROP) assumptions.

As background we would like to point out the following:

- Sometimes it is appropriate to determine plan cost associated with plan changes using existing assumptions (e.g., improving a pre-retirement death benefit). Other times it is appropriate to determine the cost by including the cost to change assumptions. An example would be changing retirement rates if the plan's NRD were proposed to be changed from age 60 to age 50. Often it is difficult to predict changes in participants' actions associated with benefit changes.

- It is often inappropriate to add to the cost of a proposed change the impact of assumption changes that are not related to proposed plan

changes. For example, if during the bargaining process a union requested an increase in the benefit rate from two percent to 2.5 percent and the plan actuary measured the cost of the current two-percent benefit using an eight-percent interest rate and the 2.5-percent proposal using a seven-percent interest rate, a dispute would likely occur.

- In most plans, actuarial assumptions do not cover all possible events. In many public plans, events that can affect benefits are often not explicitly considered due to materiality including: remarriage rates, recovery from disability, line-of-duty deaths and number of minor children post-retirement. The larger the plan the more likely some of these events will be factored into an explicit assumption. Determining the cost to change a related benefit (e.g., eliminating a remarriage penalty) often requires determining the cost using something other than the regular valuation as the base cost.

Most public plan actuaries should look at their assumptions to see if they are explicit enough to form a solid cost basis to determine the cost of a DROP. Consider the following two examples:

- "30 and out": Consider a plan that provides an NRA at the earlier of age 60 or 30 years of service. Assume also that the maximum benefit rate of 70% of pay is attained after 30 years. Because of the 70% maximum, assume that there is a material increase in retirements at 30 years of service. However, also assume that the actuary uses implicit retirement rates that only vary by age. The result is that the percent of participants assumed to retire at 30 years is likely understated. Finally, assume that the DROP ratio is only over 100% for those with more than 30 years of service. These 30+ year employees will have high DROP ratios due to the 70% maximum, and the DROP cost will likely be overstated. The overstatement is a result of assuming more participants work beyond 30 years of service than actually occurs.

- Flat salary scale: A plan could have the same pre-DROP cost using either a flat salary increase assumption (e.g., six percent) or a rate that varies by age (e.g., eight percent at younger ages and four percent at NRA). The cost of DROP depends on the salary increases only after NRD.

The cost of most proposed plan amendments is usually determined based on changes in normal cost and actuarial liability between a study "run" and the valuation baseline cost run. The valuation baseline run would normally be the same as was used to determine the most recent plan cost or valuation results. There are two alternate approaches to capturing the "true" cost of a DROP proposal if there is a question about existing assumptions or future experience. These are alternatives to a regular closed group "study" run.

> Approach 1—Revised baseline: This approach resets and/or refines the "baseline" assumptions to better reflect expected experience with a focus on assumptions that materially impact DROP cost, such as retirement rates and salary scales. Hopefully this will not materially impact the prior base line contribution rate. Once this is done the assumptions and benefits can be modified to reflect the DROP changes. The cost is simply the difference in the contribution rate between the DROP proposal and the revised baseline (usually expressed as a percentage of payroll).
>
> Approach 2—Forecast: This would start with the existing baseline assumptions and contribution rate. A baseline projection would be made that might include different projected experience vs. current assumptions. For example, the retirement assumption might be that all participants retire at NRD but the projected experience would be based on some retiring at a later age and might show a gradual actuarial gain being realized (i.e., the cost as a percentage of pay is projected to decrease over time). A similar projection would be done using the DROP benefits. The DROP projection may also include changes in both the expected and actual experience assumptions. The "cost" of DROP would be the difference between these two contribution rate projections.

Both approaches have their weaknesses. There are two concerns with the first approach. If the baseline assumptions need to be changed, the valuation actuary may have a communications problem particularly with employee unions. In addition, future changes in demographics (e.g., a large block of active participants retiring at the same time causing a material change in normal cost) can cause future variations that are difficult to demonstrate without a forecast.

The second approach may be difficult to explain to plan sponsors. There may be no initial DROP "cost". DROP cost may simply be in the form of a reduction or increase in future contribution rate.

4.8 Electing DROP at a Reduced Early Retirement Age

What happens if the DROP annuity contains an early retirement reduction? Often the result is that the DROP ratio is less than 100%. For example, assume that a participant elected DROP four years before NRA and left at NRA.

Accrued benefit at age 46 (21 years of srv):	$23,607
Early retirement factor	x 0.800
DROP annuity before COLAs:	$18,886
DROP annuity at age 50 with COLAs:	$21,256 ($18,886 x 1.03^4)
DROP lump sum:	$103,679
PV of total DROP benefit at age 50:	$424,040
Non-DROP annuity at age 50:	$34,815
PV of non-DROP annuity at age 50:	$524,725
DROP ratio:	80.8%

In these cases we have seen actuaries assume that no participant will elect a DROP when the DROP ratio is below 100%. The further below 100%, the more unreasonable it becomes to assume employees will elect DROP just as it becomes more unreasonable to assume members will not elect DROP if the ratio goes much above 100%.

The cost of DROP usually depends on a trade-off of giving up an annuity to get a lump sum. Losing the ability to grow out of the early retirement reduction usually results in the DROP being an unfavorable election (notwithstanding anti-selection issues). The forgone non-DROP annuity includes not only changes in service and pay but changes in (lessening) the early retirement reduction.

4.9 DROP Participation Rates

Many actuaries have assumed a 100% participation rate in DROPs for those who work past NRD. When the DROP ratio is over 100%, this is a worst-case cost scenario but might be a reasonable assumption.

As was discussed above, employees who elect DROPs at early retirement age often see DROP ratios under 100%, and we have seen actuaries who will not value future DROP elections that would produce a ratio of under 100%. In other situations, the DROP ratio has only exceeded 100% if elected after the maximum benefit rate is reached (e.g., 70% after 30 years of service). These situations have high DROP ratios. We have seen one situation where the "employer's" actuary[8] has only recognized these cases when determining cost during bargaining since all other situations had DROP ratios under 100%.

DROP participation rates are a function of employee needs and employee perceptions. We have focused on DROP ratios being over or under 100% (generally based on valuation assumptions) as a driving factor. From an employee's perspective, there is a different and less quantified view of annuity vs. lump-sum values, future salary increases and retirement timing. We can attempt to value some of this by developing DROP ratios using different assumptions.

Examples: We have seen DROP participation assumptions ranging from 25% to 100%.

- Baltimore City police officers and firefighters have had a DROP since 1996. Baltimore City has a very generous DROP with no mandatory retirement. DROP ratios can get up to 120%. Therefore, the DROP participation rate is high and the assumption is that 80% over NRD elect DROP. The DROP participation rate is about 80%. There are few reasons not to elect DROP since it almost always produces a better benefit, and retirement is not mandatory. Based on discussions with plan staff, we believe that the 20% who have not elected DROP: (1) may be waiting for a pay raise to factor into their average salary, (2) have elected not to work much past NRD or (3) don't trust the system.

- Anne Arundel County (Md.) has a minimum DROP period of three years and if employees leave before three years they lose their DROP benefit. Maryland State Police requires employees to retire after 28 years if they join DROP (28 years is when the maximum pre-DROP accrual rate would have been attained but there was no mandatory retirement without DROP). Both features have dampened DROP participation rates.

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[8] For bargaining the employer's actuary was not the plan's valuation actuary.

ASOP 4 requires that the assumptions selected be the actuary's "best judgment." Normally this would mean factoring in long-term future trends and past experience. Since it may be difficult to predict what kind of participation rate a retirement system will initially get when implementing a DROP (i.e., no past experience), the actuary may want to illustrate the cost using different utilization rates. Cost may be proportional to utilization rates unless the selection method is not simply an across-the-board selection percentage. The safest approach for the system may be for the actuary to assume 100% of all eligible members will elect DROP at their first opportunity (assuming the DROP ratio is greater than 100%). However, the actuary should still get input from others and ask whether this is their best estimate. Also, see related discussion of retirement rates in Section 4.4.

4.10 DROP Retirement Experience

DROPs are often touted as a way to encourage employees to continue to work past NRD. At the same time, DROPs often require retirement after a fixed number of years (e.g., three or five years). It is often difficult to predict what impact adding a DROP feature will have on the average number of years an employee will work beyond NRD. This is particularly difficult if the existing group already works an average of several years beyond their NRD. It is not uncommon for some employees[9] to work eight to 10 years beyond their NRD and for the pre-DROP plan cost to anticipate the savings associated with delayed retirements (which some trustees might not realize). In this situation it is difficult to estimate the impact on retirement rates of adding a DROP which requires retirement after three to five years.

While not quantified, Baltimore City does believe that DROP has resulted in employees working longer beyond their NRD. Their plan does contain a large incentive to work at least 4.5 years beyond NRD (see Section 3.4 for a description of Baltimore City DROP). Like Baltimore City, Dallas has a DROP that does not have a mandatory retirement rule and its employees are working longer due to DROP.

[9] The most likely situation where employees would work far beyond their NRA would be firefighters in plans that allow retirement before age 50. Expected service beyond NRA for police and general employees would likely be much less.

4.11 DROP Disability Experience

Keep in mind that for this discussion we are generally only concerned about comparing disability benefits with service retirement benefits (either pre- or post-DROP) after NRD. Are liabilities higher for disability benefits than service retirement benefits? Offsetting the fact that disability benefits at retirement ages are often higher than service retirement benefits is the fact that post-disability mortality rates might be higher than other post-retirement mortality rates.

Some DROP plans eliminate the disability benefit coverage during the DROP participation period. For public safety plans, many disabilities (30% to 60%) occur near NRD. This will affect funding.

The Dallas DROP does not allow for disability benefits and has noted a material decline in disabilities.

Baltimore City still allows a DROP participant to apply for a disability benefit in lieu of his DROP benefit. However, even here disability claims have declined materially both before and after NRD. This reflects the fact that employees are reluctant to give up their current or soon-to-be DROP lump sum and disability claims have a "voluntary" aspect to them after NRD.

Even if by electing DROP a member is no longer eligible to apply for disability (based on being retired for plan purposes), workers' compensation rules will still apply. This may be important since the pension plan may be treated as a workers' compensation offset. If the DROP benefit is less than the disability benefit, the workers' compensation offset is reduced.

4.12 Impact of DROP and Pre-DROP Design on Plan Cost

Both the design of the DROP and the pre-DROP design are important since they both impact the DROP ratio. The DROP ratio will be an important factor in how employees react.

Many fire and police plans in Pennsylvania are designed with relatively few accruals after NRD, yet many employees continue to work beyond their NRD. The result is that if a traditional type of DROP design is considered, employees show great interest but we find very high DROP ratios and DROP

cost. Conversely, a plan with high post-NRD accruals helps reduce the cost of DROP.

As was mentioned previously, DROP ratios are high when the pre-DROP benefit accrual rate is frozen. The State of Maryland Police DROP has required that the DROP participation period not extend past the point when the pre-DROP accrual rate would have ceased. Because the plan requires mandatory retirement at the end of the DROP period, it is not clear that adding mandatory retirement to the DROP feature does anything but increase plan cost (notwithstanding other personnel issues).

Whether or not a plan has a COLA will impact the DROP ratio, DROP cost and employee choice. Whether the presence of a COLA increases or decreases the cost of a DROP will depend on other factors. In Section 4.6 there was an illustration where having a COLA increases the cost of a DROP.

Everything in the design of the DROP (e.g., mandatory retirement, treatment of employee contributions, COLAs on DROP annuities, interest crediting rates and disability coverage) will have some impact on participation. Two factors that can materially keep down participation are: (1) requiring a number of years of participation in the DROP in order to be entitled to the benefit and (2) placing a reduced amount of the annuity into the DROP account.

4.13 Funding Approaches

This section is about understanding the dynamics of DROP cost. To do this we will sometimes make assumptions that do not represent the average DROP plan. We recognize that the average DROP plan does often provide a benefit improvement and a higher cost.

When does normal cost end?

As was discussed in Section 4.3, one issue is whether employer funding (i.e., normal cost) should end: (1) at the point the participants elect (or are expected to elect) DROP or (2) when they ultimately leave the payroll. Either choice could produce the higher current contribution depending on the following:

1. The value of the DROP benefit measured by the DROP ratio
2. The funding method and amortization period

3. The relative number of employees working beyond NRA

For the following discussion, assume that the DROP ratio is always 100% and there are no employee contributions either before or after the DROP period. Also assume that existing retirement rates presume that employees work beyond their NRD and that the actuarial present value of the deferred retirement benefits is equal to the present value of the benefit at NRA (or current age if later). Also ignore any issues related to pre-retirement death or disability benefits during the DROP period. (Later we will peel away some of these assumptions and deal more with short-term vs. long-term cost.) The following would occur:

1. The benefit provided would be in a different form but with the same actuarial value.

2. The cost of the plan would not change if the retirement experience did not change because of the assumption that the DROP ratio is 100%.

3. The contribution rate of the plan would change if all participants were assumed to elect DROP at their NRD (or current age if later) and funding/normal cost was targeted to end at the point when DROP is elected. More importantly the new contribution rate is identical to the contribution rate produced by assuming that no person elects DROP and that all retire at their NRD. To some this is not an unnatural position since DROP participants are often assumed to be "retired."

Consider how the "cost" might change under the following methods:

- Assume that the funding method is the aggregate funding method. As we described this plan, the present value of future benefits and present value of future normal cost remain unchanged. The spreading factor (present value of future salary/salary) is changed. We eliminate employees that are beyond their NRD thereby raising the spreading factor. However, we also shorten the factor for other employees that no longer are expected to work beyond their NRD (or more accurately are no longer expected to have a normal cost beyond their NRD). Which of these two factors will determine whether the contribution rate increases or decreases? The point is to understand that employees already working beyond their NRD when a DROP is

added need to be considered. For a firefighter plan this could be a significant percentage of all employees (20% to 30%).

- Assume that the funding method is an individual cost method such as entry age normal. We would expect that the actuarial liability would increase. The normal cost will increase for those not yet at their NRD and become zero for those at or beyond their NRD. Like the aggregate funding method, whether the total normal cost increases or decreases depends on the mix of employees above or below their NRA. Generally we would expect that the normal cost, actuarial liability and contribution rate would increase. However, why should the contribution rate increase under this type of DROP (i.e., 100% DROP ratio)? The answer is that the long term cost (cost = benefits paid + expenses – investment income) does not change. Only the current contribution amount changes in order to accelerate funding by NRD.

The above had some "unnatural" parameters: DROP ratio = 100% and no employee contributions pre or post-DROP. In addition, adding a DROP feature will have some impact on retirement rates. Next we consider how these will affect plan cost.

Some issues related to long-term vs. short-term cost

For reasons discussed earlier, DROP ratios are often greater than 100%. Assume we are looking at a DROP equal to the present value of the NRD benefit plus future employee contributions plus COLAs (DROP account value based on 100% of the NRD annuity benefit and employee contributions, with interest at the valuation rate and COLAs credited during the DROP period). Assume that the DROP ratio is always above 100% after NRD. As a general rule this implies that long- and short-term cost should be higher <u>if retirement rates are not affected</u>. Most public safety plan valuations assume some employees work beyond their NRD, and the immediate contribution rate increases due to DROP might be representative of long-term cost. However, assume that the plan's pre-DROP valuation assumes everyone retires at their NRD or current age if later (not an uncommon situation in a small plan even if it overstates the true cost).

The DROP would appear to have no "cost" or actually produce contribution rate savings if post-NRD retirement rates were added. This leads to several observations:

- The cost of DROP might be more accurately portrayed by looking at a forecast of plan contributions (as discussed in Section 4.7) rather than just the immediate impact on the current contribution requirement. This would allow adjustments for decisions made about whether normal cost ends at NRA (which can be the assumption either before or after the addition of the DROP feature). It can also factor in the impact of changes in retirement rates and timing of new hires. However, as a practical matter this type of projection may be difficult to perform.

- Should two plans with the same benefit provisions both before and after the addition of the DROP have a different cost because of differences in assumptions? The best illustration might be to assume we have separate police and fire plans with the same benefits. Police officers often retire closer to their NRD than do firefighters. This often shows up in higher retirement rates for police officers and higher pre-DROP cost. Ages further beyond NRA usually have higher DROP ratios. The result is that the cost (and benefit) of adding a DROP is higher for the average firefighters (even if they are in a plan combined with police officers).

How will DROP affect retirement rates and how will changes in retirement rates impact plan cost?

What happens if we determine the cost of DROP by: (1) assuming no change in retirement rates or (2) determining the cost after we lower retirement rates? This second situation could arise simply by assuming everyone takes DROP and retires at the end of the maximum DROP period.

In the first situation the cost of DROP will just reflect the DROP ratios. Often we think of this as a weighted DROP ratio. Figure 4.2 showed a weighted DROP ratio of 102.64%. The DROP ratios shown in this chart assume that DROP is elected at NRD. This could not be true if: age at decrement – NRA > maximum DROP period. Based on Figure 4.2, we would expect that liabilities and normal cost associated with the retirement decrement would increase by about 2.64%. This might be reduced if less than 100% were assumed to elect DROP. This might

not be a proportionate reduction, keeping in mind that in figure 4.2, 40% are assumed to retire at NRD before being able to elect DROP.

What happens if we assume that adding a DROP feature will extend the time worked beyond NRD (and funding extends beyond NRD)? Often we look at the cost of a DROP assuming no change in retirement rates and then look at the additional change in cost if retirement rates are lowered. The result will vary from plan to plan; however, we would expect to see the same type of change between the two DROP results had we made this retirement rate change using pre-DROP benefits: (1) little change in the present value of future benefits, (2) a decline in actuarial liability and (3) a decline in the normal cost. However, as mentioned earlier, the group of employees immediately eligible for DROP when the feature is added should be considered separately as described below.

It would not be unreasonable to assume that the addition of a DROP will immediately make some people delay their retirement. Under individual funding methods (e.g., entry age normal and projected unit credit), the normal cost is discounted by the current year's retirement rate which could be 100%. For these employees it would be common to find that the impact of lowering retirement rates (having already factored in DROP cost based on current retirement rates) is: (1) little change in the present value of future benefits, (2) a decline in actuarial liability and (3) an increase in the normal cost (often from $0). To some extent this is a temporary phenomenon since at the end of the first DROP period, the initial large cohort of DROP participants will all retire and their normal cost will again disappear. However, whenever there is a large group of employees already beyond their NRD, this factor should be considered and the actuary should not just look at weighted DROP ratios to estimate plan cost.

How do employee contributions factor into DROP cost?

Many DROP plans discontinue employee contributions when a DROP is elected. For those that continue contributions, some place them in the DROP lump-sum accounts and some do not (i.e., they are just used for the overall funding of the plan). How are these different situations handled? We can quote an earlier sentence that would still apply here: "If the actuary assumes normal cost ends at NRD (when DROPs are assumed to be elected) this problem is avoided but it can be argued that the true cost of the DROP might be overstated." While this may be the "safest" way around dealing with contributions we would like to offer the following thoughts assuming funding (normal cost) extends through the DROP participation period.

If employee contributions end when the employee elects DROP:

- A similar situation exists in many plans when the maximum accrual rate is reached and the plan discontinues requiring employee contributions (e.g., benefit equals 70% of average salary after 30 years of service and employee contributions are discontinued).

- One direct way of handling this under a spread gain funding method is to simply reduce the present value of the employee contribution to reflect the future discontinuation of employee contributions. Another way would be to load the retirement benefits by a DROP ratio whose numerator includes the employee contributions that are "retained" by the employee after they elect DROP.

- Under projected unit credit there is a gross normal cost developed that is then offset by the expected employee contributions for the current year. This would likely result in a jump in the normal cost when employee contributions cease (i.e., when DROP is elected).

- Under entry age normal the employer share of the plan's normal cost probably does not jump up when employee contributions stop. The discontinuation of employee contributions is often anticipated when developing a level employer normal cost. Another method is to develop a level gross normal cost and offset it by the actual anticipated employee contributions.

If employee contributions continue during the DROP period:

- These types of designs probably present few issues in this area. Treatment of employee contributions as an offset to employer normal cost can remain unchanged.

- Whether or not employee contributions are added to the DROP lump sum (or simply contributed to the fund with no direct impact on the DROP annuity or lump sum) will affect the value of the benefit and the overall cost of the plan and the DROP. However, the normal cost offset for employee contributions is probably not affected as long as the employee contributions are being made.

- The decision to continue employee contributions is generally a plan-wide choice and not made on a participant-by-participant basis. This is often required to maintain 414(h) pick-up status for governmental plans.

- DROP ratios require no adjustments if contributions continue.

How might back DROPs impact funding?

Adding a back DROP feature presents some anti-selection problems. Obvious among these is the ability to adjust the retirement date and the DROP participation period to deal with late increases in pay. However, from a funding perspective it also does the following:

1. Avoids the question about whether a participant has a normal cost during the DROP participation period.

2. Avoids dealing with treatment of discontinued employee contributions during the DROP participation period.

3. Reduces the likelihood that participants will retire sooner when under current assumptions there is a significant number of assumed retirements where: Age at decrement – NRA > maximum DROP participation period. In other words, the fact that the employee does not have to commit (at the point they elect DROP) to a fixed future retire date makes it possible to work longer.

How might an actuary factor in anti-selecting? Three thoughts:

1. Simply assuming that a person will retire when the DROP ratio is the highest is not a solution as it often will produce the latest retirement age assumption and the lowest cost.

2. One basic approach is to assume that no one will elect DROP when the ratio is under 100% and everyone will elect DROP when the ratio is over 100%.

3. Even if we have a set of fixed DROP ratios based on valuation assumptions, there will be some variation due to different histories of pay increases. The actuary could go back and determine what the

ratios would be today for those who currently are beyond their NRD (using real salary histories) and compare them to the theoretical values. An adjustment loading could be made, particularly where the theoretical ratio was under 100% but the actual exceeded 100%.

How do we measure liabilities for members who have already elected a forward DROP?

Valuing liabilities for members during their DROP participation period can be straightforward. Often this group can be valued separately with some extra data being collected (i.e., frozen DROP benefit with any COLAs at valuation date and DROP account balance at valuation date). These balances can be projected forward to expected termination date and discounted back at the valuation assumption (e.g., assume everyone retires after a four-year DROP period if the maximum DROP period is five years). Alternatively, the actuary could assume that all will retire immediately.

There can be other events the actuary might want to consider. If the assumption is not that they will retire immediately and disability benefits continue to be offered, the actuary might want to value future disability contingencies. The probability of death between the valuation date and termination might be factored in or treated as future gains and losses.

Many public plans use entry age normal as their funding method. Past decrements and the non-DROP benefit can affect the calculation of normal cost. This might be difficult to program and might require salary data not normally needed for DROP participants.

Total employer cost perspective

The actuary is often asked the question: What will this do to total employer cost? Normally we avoid quantifying a global answer since it involves issues beyond retirement plan cost. Assuming that retirement rates (or retirement experience) are changed, some of the areas discussed include:

1. Higher retirement plan cost
2. Higher/lower active employee health care cost
3. Lower/higher retiree health care cost
4. Higher payroll cost to retain senior top level employees
5. Fewer new hires and lower training cost

6. Efficiencies associated with retaining experienced employees (e.g., fewer citizen lawsuits over actions of rookie police officers, more experienced detectives)
7. Cost of blockage of promotional opportunities

Also see Section 7.2.

4.14 General Cost Formula

We believe that DROPs are complicated enough to justify a complete valuation model of plan design. However, to make some cost estimates just using a spreadsheet and to test for reasonableness of valuation output, we often follow the following steps:

- Produce a chart of DROP Ratios at various age and service combinations. An illustration is shown in Appendix B, Example #3. This can be overlaid with retirement probabilities to get a more complicated version of figure 4.2. The sum of the products provides a weighted average of your DROP ratio. This is a first approximation of the increase in liabilities associated with the retirement decrement.

- Sample lives such as those shown in Appendix B, Example #1, can be done again to check the results from the method in the prior paragraph. This sample life check can then be expanded to get an idea of the impact of changes in retirement rates (i.e., as in Appendix B, Example #2).

- Several times we have mentioned the importance of considering the impact of those immediately eligible to join the DROP if the immediate retirement rate is to be lowered. One quick item to look at is the sum of the immediate retirement decrements before and after a change in assumptions to get an idea of how many employees will again have an employer normal cost. In addition, if these employees elect DROP and employee contributions are discontinued, you might want to estimate the amount of lost contributions in a similar fashion. However, if this group is of a material size you will likely want a more complete valuation model to get a better idea of the immediate impact even though the long-term impact might be different.