AMERICAN ACADEMY *of* ACTUARIES

Report of the American Academy of Actuaries'
Annuity Reserves Work Group

Presented to the National Association of Insurance Commissioners'
Life and Health Actuarial Task Force

St. Louis – September 2006

The American Academy of Actuaries is a national organization formed in 1965 to bring together, in a single entity, actuaries of all specializations within the United States. A major purpose of the Academy is to act as a public information organization for the profession. Academy committees, task forces and work groups regularly prepare testimony and provide information to Congress and senior federal policy-makers, comment on proposed federal and state regulations, and work closely with the National Association of Insurance Commissioners and state officials on issues related to insurance, pensions and other forms of risk financing. The Academy establishes qualification standards for the actuarial profession in the United States and supports two independent boards. The Actuarial Standards Board promulgates standards of practice for the profession, and the Actuarial Board for Counseling and Discipline helps to ensure high standards of professional conduct are met. The Academy also supports the Joint Committee for the Code of Professional Conduct, which develops standards of conduct for the U.S. actuarial profession.

Annuity Reserves Work Group

James W. Lamson, F.S.A., M.A.A.A., Chair
Michael C. Ward, F.S.A., M.A.A.A., Vice-Chair

Larry J. Bruning, F.S.A., M.A.A.A.
Rod Bubke, F.S.A., M.A.A.A.
Thomas A. Campbell, F.S.A., M.A.A.A.
Donna R. Claire, F.S.A., M.A.A.A.
Matthew P. Clark, F.S.A., M.A.A.A.
Richard A. Combs, F.S.A., M.A.A.A.
Michael F. Davlin, A.S.A., M.A.A.A.
John J. Froehle, F.S.A., M.A.A.A.
Jeff L. Gimbel, F.S.A., M.A.A.A.
Larry M. Gorski, F.S.A., M.A.A.A.
Sarah J. Hamid, F.S.A., M.A.A.A., F.C.I.A.
Sean Hayward, F.S.A., M.A.A.A.
Scott D. Houghton, F.S.A., M.A.A.A.
George Jennings, F.S.A., M.A.A.A.
William Kling, F.S.A., M.A.A.A.
Geetha Kunchakarra, A.S.A., M.A.A.A.
R. Lisa Lefkowitz, A.S.A., M.A.A.A.
Craig F. Likkel, F.S.A., M.A.A.A.
Thomas Nuckols, F.S.A., M.A.A.A.
John M. O'Sullivan, F.S.A., M.A.A.A., F.C.A
Chad Padgett, F.S.A., M.A.A.A.
Richard C. Payne, F.S.A., M.A.A.A., F.C.I.A.
Matthew D. Schafer, F.S.A., M.A.A.A.
Eric S. Schwartz, F.S.A., M.A.A.A.
Rebecca B. Scotchie, F.S.A., M.A.A.A.
Martin Snow, F.S.A., M.A.A.A.
Carolyn J. Stontz, F.S.A., M.A.A.A.
Nazir Valani, F.S.A., F.C.I.A., M.A.A.A.
Marc I. Whinston, F.S.A., M.A.A.A.

The Annuity Reserves Work Group (ARWG) would like to recognize the following Academy members for their valuable input: Michael W. Boerner, John K. Bruins, Leda J. DeBarba, Gary Falde, J. Timothy Gaule, Sara Hamid, William Kling, Michael McDonald, Hubert B. Mueller, Terry Owens, Chris Peck, William Sayre, and Keith C. Werschke.

The ARWG would also like to acknowledge the work of Tom Chamberlain, Dean A. Kerr and Chris Oppliger.

Executive Summary

The September 2006 ARWG report consists of this two-page executive summary and three appendices. While the appendices provide considerable expansion of the points covered in this executive summary, readers already familiar with previous reports of the ARWG may only need the appendices for reference purposes.

Issues

The Annuity Reserves Work Group continues to make progress in the development of a proposal for principles-based reserves for non-variable annuities. Since the June meeting of LHATF, we have investigated and considered a number of issues that had been previously identified and have resolved a number of them. They are reflected in revisions to the Methodology Outline we presented to the Life and Health Actuarial Task Force (LHATF) in our June 2006 report using "redlining" of the changes, and are included in Appendix 1 to this report. Tentative resolutions to some of these issues are shown below, along with Open Issues for which the ARWG is requesting feedback from LHATF.

Open Issues:

- **New Business or All Business Inforce?** Should the new principles-based reserve requirements apply to all non-variable annuity business in force or just to business issued after the effective date? Implementing these requirements for all in-force business as of a given date would address concerns raised at the June 2006 LHATF meeting about possible reserve deficiencies. However, having the new requirements only apply to business issued after the effective date would minimize the effort required to comply with them and would produce the smallest change in balance sheets.

- **"Small and Low Risk" Blocks:** Does LHATF believe that a simplified methodology should be developed for "small and low risk" blocks of non-variable annuity business? This approach would require development of (a) requirements for how to determine if a block is "small" (absolute or relative size to be determined), (b) requirements for how to ensure that only "low risk" blocks qualify, and (c) a simplified reserve calculation method, such as the current Actuarial Guideline 33. This issue is more fully discussed in Appendix 3 of this report.

- **Form of Requirement:** The ARWG would appreciate receiving feedback from LHATF regarding whether principles-based reserve requirements for non-variable annuities could be adopted using an actuarial guideline, similar to AG VACARVM applying to variable annuities, or whether a model regulation approach currently proposed for life insurance reserves should be pursued instead.

Tentative Resolutions:

- **Alternative Reserve Calculation Option:** Consideration was given to the development of predetermined scenarios and weights to be applied in lieu of a CTE calculation based on stochastic scenario results that would be similar to those allowed under the original C-3 Phase I requirements. The ARWG was not in favor of this approach and recommended to the Academy's Standards for Stochastic Methods Work Group (SSMWG) that this not be pursued. The SSMWG, after much deliberation, has not recommended this option to the Academy's Life Financial Soundness and Risk Management Committee (SVL2 Committee). The ARWG, however, does believe that it may be possible for companies to develop scenarios and weights, called "Proprietary Predetermined Scenarios and Weights" that will produce reserves at least as large as that resulting from the CTE method applied to stochastic scenario results. This was recommended by the ARWG to the SSMWG who included it in its recommended options to the SVL2 Committee. The ARWG intends to pursue the development of appropriate principles-based requirements to use this approach and to test its feasibility. This approach, unlike the "Small and Low-Risk Blocks" concept, could be used by small and large companies alike, and would not require that the business be "low risk."

- **Discount Rates:** Item VI of the Methodology Outline addresses the discount rate for calculating the Greatest Present Value of Accumulated Deficiency (GPVAD). The ARWG's tentative recommendation is that a scenario's Accumulated Deficiencies be discounted using that scenario's simulated statutory statement returns on general account assets, exclusive of policy loans and any hedge instruments included in Starting Assets or projected to be traded under simulated hedging. The reason for this recommendation is that our currently proposed methodology would require that Starting Assets be at least as large as the reserve being calculated, with the assets ultimately backing that reserve being considered a percentage of the Starting Assets. Since policy loan amounts stem solely from policyholder decisions, and since scenario liability metrics rather than Accumulated Deficiencies drive the amounts and timing of hedging trades, neither of these excluded types of assets can realistically be proportionately reduced.

- **Working Reserve:** Our tentative recommendation for the Working Reserve is the cash surrender value for products having one, and zero for other products, such as payout annuities. However, the ARWG Analysis Subgroup is currently working on models of payout annuity business using zero Working Reserves and using Working Reserves equal to the present value of future income, and both approaches will be reviewed in light of the results obtained. See item VIII of the Methodology Outline.

- **Projected Credited Rates:** Our current recommendation is that projected investment returns from policy loans and hedge instruments need not necessarily be reflected in the determination of interest rates credited (i.e., in the projected determination of non-guaranteed elements) to deferred annuities or other similar products. The rationale for this is that "excess interest" is typically not credited to the portion of a contract's account value equal to a policy loan and that if income from hedge instruments purchased to hedge risks in the liabilities (i.e. hedges other than those purchased as a part of a company's normal investment policy) were included in the determination of credited rates, this would result in a portion of the projected income not being available to cover the future risks for which the hedging is performed. [Note: more guidance is needed to determine when returns from hedge instruments may (or should) be include in projected credited rates.]

  In addition, to the extent that Statutory Accounting continues to require a separate reserve or liability such as a dividend liability for non-guaranteed elements, then also including payment of these same non-guaranteed elements in the projected cash flows for a CTE-based reserve would result in double-reserving for them and a reserve adjustment should then be made to avoid this. See Item XVI of the Methodology Outline.

- **Assumed Competitive Environment:** It is felt that simulating the competitive environment for business in force at projected durations within a scenario is a very important requirement to adequately project the effects of disintermediation and other risks within the projections, especially since the competitive environment affects both company and contractholder behavior. As a result, the Assumed Competitive Environment has been identified in Item XVII of the Methodology Outline as one of the Prudent Best Estimate Assumptions.

Analysis Subgroup Modeling & Results

The Analysis Subgroup of the ARWG is developing financial models for the purposes of testing potential principles-based reserve methodologies that could be employed for the calculation of non-variable, deferred and immediate, annuity reserves. The ARWG intends to develop several models that represent a broad range of annuity products. The first of these is a single premium deferred annuity (SPDA) liability model for which the assumptions and some model results are presented in Appendix 2 and summarized below. The models are being created using several different proprietary software systems. There are five software platforms being used by the subgroup at this time: Milliman's MG-ALFA®, Tillinghast's MoSes® and TAS®, SunGard's Prophet® and GGY's Axis®. The models are created in several of these software platforms simultaneously, and differences in the results of the models on the different software platforms are researched and reconciled.

In addition to the SPDA liability model, an asset/liability model for the SPDA, and a liability model for a single premium immediate annuity (SPIA) are being developed. Development of the SPDA asset/liability model and the SPIA model are still in progress, so the results included in this document are for the SPDA liability model only. The results compare the software platforms and do not yet include calculation of the GPVAD or resulting reserve values derived by applying a CTE measure to the results. Rather, the primary purpose of both the liability-only and asset/liability SPDA models is to ensure that all five of the actuarial software models have been set up and calibrated to produce results that are as consistent with each other as possible to allow all users of the results to have full confidence in the results. A summary of the 5th and 10th projection year values from each of the five software packages for policy count, account value and cash value is included in the table below. The results are generally close to each other, providing confidence that the packages do not include any significant bias. Therefore, it is possible to check one system's output against the other, providing the desired peer review intended when using any two of the packages to produce the same modeled results.

Comparison of 5th & 10th Year Projected Values by Software Package

Software Package	Policy Count		Account Value		Cash Value		AV per Policy		CV per Policy	
	5	10	5	10	5	10	5	10	5	10
A	14.967	7.476	679,257	388,368	675,907	388,368	45,383	51,946	45,159	51,946
B	14.961	7.473	679,893	389,269	676,544	389,269	45,444	52,088	45,220	52,088
C	15.022	7.490	684,693	391,079	681,343	391,079	45,581	52,211	45,358	52,211
D	14.902	7.368	676,588	384,411	673,238	384,411	45,402	52,174	45,177	52,174
E	14.953	7.467	691,680	405,324	688,330	405,324	46,256	54,280	46,032	54,280

Appendix 1 – Outline of Methodology

[Drafting Note: Text added or stricken since the June 2006 Report to LHATF is underlined or lined through.]

I. **Principles:** The ARWG seeks to develop a reserve proposal that follows a Principles-based Approach as recommended by the *Life Financial Soundness/Risk Management Committee* of the American Academy of Actuaries. A principles-based approach means an approach to calculate statutory reserves and capital requirements for insurance companies that incorporates the following concepts:

a. Captures all of the material financial risks, benefits, and guarantees associated with the contracts, including the 'tail risk' and the funding of the risks.
b. Utilizes risk analysis and risk management techniques to quantify the risks and is guided by the evolving practice and expanding knowledge in the measurement and management of risk. This may include, to the extent required by an appropriate assessment of the underlying risks, stochastic models or other means of analysis that properly reflect the risks of the underlying contracts.
c. Incorporates assumptions and methods that are consistent with, but not necessarily identical to, those utilized within the company's overall risk assessment process. Company risk assessment processes include but are not limited to experience analysis, asset adequacy testing, GAAP valuation and pricing.
d. Permits the use of company experience, based on the availability of relevant company experience and its degree of credibility, to establish assumptions for risks over which the company has some degree of control or influence.
e. Provides for the use of assumptions, set on a prudent best estimate basis, that contain an appropriate level of conservatism when viewed in the aggregate and that, together with the methods utilized, recognizes the solvency objective of statutory reporting.

II. **Scope of Business:** All annuity business written directly by an insurer or assumed through reinsurance, except business covered by proposed Actuarial Guideline AG VACARVM. This should include, but not be limited to, the following types of products: [Note that the business to be covered as recommended here, together with the business covered by AG VACARVM includes more business than is currently within the scope of CARVM.]

a. Payout Annuities
b. Longevity Insurance
c. Structured Settlement Annuities
d. Traditional deferred annuities with an accumulation value determined as premiums paid less loads plus interest credited at rates declared by the insurer
e. Two-tiered Annuities
f. Market Value Adjusted Annuities
g. Equity Indexed Annuities
h. Bond Indexed Annuities
i. Modified Guaranteed Annuities
j. "CD" Annuities
k. General Account Bond Allocated Annuities
l. Multi-bucket Annuities
m. Directed Annuities
n. Charitable Annuities
o. Interest Indexed Annuities
p. GICs
q. Synthetic GICs
r. Funding Agreements
s. Group Deposit Administration Contracts
t. Terminated pension plan annuities
u. Qualified Plans (e.g., 401(k)s, IRAs, 403(b), 457)
v. Life & Annuity Combinations & Annuity Riders
w. Reinsurance Assumed: All business acquired or annuity risks accepted through any form of reinsurance, whether or not reinsurance reserve credit is taken by the ceding company, shall be reflected in the projections. Companies assuming annuity risks are to look to their reinsured companies for assistance in obtaining sufficient information to develop appropriate assumptions.

III. **Small and Low-Risk Blocks:** Exemption for small, low-risk blocks of business, as discussed in Appendix 3 of this report.

IV. **Basic Description:** While the ARWG is starting with a "clean slate," it nonetheless is influenced by the work of the Variable Annuity Reserve Work Group, the Life Reserves Work Group and the other groups working on Principles-

Based Approaches to reserves and capital determination under the auspices of the Financial Soundness and Risk Management Committee of the American Academy of Actuaries. As such, this preliminary outline of methodology calls for a cash flow projection of the business in force for purposes of determining projected deficiencies at points in the future.

a. For each Required Scenario, a projection shall be performed for a sufficient number of years into the future so that no further projection ~~of surplus amounts~~ will materially affect the Scenario Greatest Present Values and shall be performed using the Required Scenarios.
b. The projection will simulate investment, reinvestment and disinvestment of assets according to the Investment Strategy.
c. The projection will simulate declaration of credited interest rates, to the extent the products included in the projection require them, following the Crediting Strategy.
d. If the insurer is following a Clearly Defined Hedging Strategy (CDHS), the projections shall either simulate the effect of the CDHS or else the impact of the CDHS may be separately determined and the resulting reserves based on the scenarios adjusted for the impact of the CDHS. [Note: Whether there may be a need for CDHS will be determined through the development of appropriate governance.]
e. Projected contractholder behavior will be determined using Prudent Best Estimate assumptions with appropriate aspects of such behavior determined on a dynamic basis. [Note: The appropriate level and purpose of margins used for the development of Prudent Best Estimate assumptions will be as recommended by the *Financial Soundness and Risk Management Committee* but ultimately determined by LHATF. In addition, the Work Group will consider assumptions relating to renewal premium payments by group and individual contractholders, especially if interest rate guarantees apply to them, and assumptions regarding transfers between subaccounts if such option applies.]

V. **Scenario Greatest Present Value:** The Scenario Greatest Present Value for a Required Scenario is defined as the sum of the Starting Asset Amount plus the greatest present value of Accumulated Deficiencies within future projection periods for that Required Scenario.

VI. **Discount Rate for Present Value of Future Deficiency:** The total portfolio returns on modeled assets resulting from projecting the Starting Assets (other than policy loans and assets held to hedge contract performance guarantees) and projected positive and negative cash flows using the Investment Strategy. However, the discount rate shall be determined without regard to the effects of any simulated dynamic hedging within the projections. [Note: No recommendation has yet been made regarding whether there is a need for definition of a Clearly Defined Hedging Strategy and whether hedging can be reasonably separated from normal investment activities.]

VII. **Accumulated Deficiency:** Projected Working Reserve less Projected Annual Statement Value of Assets.

VIII. **Working Reserve:** The Working Reserve for a given contract is to be determined as either (a) or (b) below. ~~[Note, the ARWG is still considering the issue of how the Working Reserve should be determined.]~~

a. Projected cash surrender value (reflecting any market value adjustment) for contracts having such a value. [Note: More consideration needs to be given to projection of market value adjustments.]
b. Zero for all other contracts. [Note: This is still considered to be a tentative recommendation by the Work Group. Our rationale for this is that if the Working Reserve were set equal to the present value, at statutory valuation interest and mortality, of expected income payments for payout annuities, ~~for contracts not having a cash value~~ this would effectively set the currently-required reserve as a minimum reserve resulting from application of the requirements outlined herein. ~~Note: It is uncertain as of this writing whether this will work for all business not having a cash value. In addition, consideration must still be given to projecting expected income payments that are tied to an external index.~~ The Analysis Subgroup is developing payout annuity models that will be used, among other things, to help determine the appropriateness of using a zero Working Reserve for this and other types of business not having a cash surrender value.]

IX. **Starting Assets:** Annual Statement value of assets assigned to the projected business according to the Asset Segmentation and greater than or equal to ~~(100+X)% of~~ an approximation to the reserve being determined. [Note that this may be affected by whether or not the new method would apply to business already in force or just that written after the effective date of the new requirements.]

a. Ideally, the adjustment to Starting Assets in the determination of the Scenario Greatest Present Value in item V should result in a reserve and corresponding adjusted amount of Starting Assets which, if projected anew using the Required Scenarios, would result in a new adjustment approximately equal to zero. However, it is not intended that such re-projection would be required.
b. To accomplish this, the actuary should allocate Starting Assets at least as large as ~~equal to (100+X)% of~~ the reserve expected to result from the CTE calculation. In this manner, the adjustment to Starting Assets should be negative and can be considered a pro-rata reduction in assets. If the adjustment turns out to be positive, then a new set of Starting Assets would have to be identified and projections based on the Required Scenarios performed again.

c. For the above reasons, the Discount Rate in item VI is defined as the projected portfolio return.

X. **Reserve:** The determination of the reserve depends on whether Required Scenarios are stochastic or are a limited number of scenarios specified along with weights.

a. Stochastic Scenarios: Reserve equals a CTE measure applied to a ranking from smallest to largest of the Scenario Greatest Present Values.
b. Specified Scenarios: Reserve equals an approximation to a CTE value determined as the sum across all Required Scenarios of products of the Scenario Greatest Present Values times associated weights determined through a process yet to be developed.
c. Is there a need for a "seriatim reserve"?
    i. Could this be the AG33 reserve?
    ii. What if this reserve in the aggregate exceeds the stochastic reserve?
    iii. Should there be a cash value comparison connected to the seriatim reserve?

XI. **Aggregation:** The Scenario Greatest Present Value for a given scenario may be determined after aggregating the Accumulated Deficiencies at each point in time within the scenario for all or a part of the business falling within the scope of these requirements.

XII. **Required Scenarios:** Either stochastic scenarios determined using an interest rate model meeting specified calibration criteria or a set of scenarios generated in a specified way, such as by a scenario generator similar to that used in C-3 Phase I (as is being revised by the Academy Economic Scenarios Work Group), and intended to be used with a set of weights applied to the resulting Scenario Greatest Present Values. If stochastic, scenarios could potentially be determined:

a. By the actuary using an interest rate model calibrated to satisfy stated calibration criteria; or
b. By an interest rate model created and parameterized by the American Academy of Actuaries' Economic Scenarios Work Group; or
c. Using pre-packaged scenarios produced by the American Academy of Actuaries' Economic Scenario Work Group.

[Note: The ARWG recognizes the need to consider equity risks present in some annuity products falling within the scope of the new requirements and will develop a recommendation for reflection of them.]

The approach taken within this Principles-based Approach will be overseen by the *Life Financial Soundness/Risk Management Committee* of the American Academy of Actuaries.

XIII. **Assumptions for Projections:** Prudent Best Estimate assumptions determined in accordance with the requirements recommended by the *Life Financial Soundness/Risk Management Committee* of the American Academy of Actuaries. [Note: Guidelines regarding the actuary's appropriate development of Best Estimate Assumptions need to be developed by building on the work done in this regard by the VARWG and the LRWG.]

XIV. **Reinsurance Ceded:** Projections are to be performed net of reinsurance premiums and recoveries, together with all associated expenses, from treaties that are eligible for reinsurance credit under the NAIC Life and Health Reinsurance Agreements Model Regulation. Companies with ceded reinsurance risks are to cooperate with their reinsurers in providing information needed by the reinsurer for their projections. Note: Consideration must be given to possible requirements regarding the determination of direct reserves (gross of reinsurance), experience refund reinsurance, aggregation effects on gross and net reinsurance, reinsurance treaties that are aggregate in nature, reinsurance credit with non-admitted (unauthorized) reinsurers, and the types of approximations for determining Annual Statement values that should be allowed.

XV. **Investment Strategy:** The Investment Strategy consists of a set of rules established by the company, its reinsurers, or reinsureds that embody the methods and parameters by which investment, disinvestment, portfolio rebalancing, and reinvestment of positive and negative cash flows arising from the business under scope will be performed within projections. [Note: The Work Group intends to consider the use of investment activities such as dollar roll and reverse repurchase transactions. In addition, the Work Group will consider whether hedging activities can be considered as distinct from the normal investment activities undertaken in support of non-variable annuity business, and whether requirements for a Clearly Defined Hedging Strategy should be determined.] The actuary must ensure that the Investment Strategy modeled within the projection:

a. Is consistent with the actual investment strategy that the insurer intends to implement from the perspective of credit quality, asset allocation, foreign currency exposure, duration and other risk measures used to characterize the actual investment strategy of the insurer; [Note that this may require a certification from a senior member of the company's investment department and will be investigated further by the ARWG]
b. Be sufficiently detailed to ensure that simulated buying and selling of assets make sense from the perspective of the economic environment likely to spawn the interest rate and/or equity scenarios used for the projection;

c. Properly anticipates that such buying or selling could actually be accomplished given the markets that would likely exist within the economic environment;
d. Be documented in a fashion that allows reviewers and users of the projections to verify its proper simulation within the projections; and
e. Complies with the regulatory governance requirements in effect.

XVI. **Crediting Strategy:** The Crediting Strategy consists of a set of rules established by the company, its reinsurers, and reinsureds, that embody the methods and parameters by which any interest crediting rates will be determined within projections. The actuary must ensure that the Crediting Strategy modeled within the projection:

a. Is sufficiently detailed to provide for proper simulation of setting of credited interest rates given the interest rate and/or equity scenarios used for the projection;
b. Allows for credited rate determination following the time intervals (annually, quarterly, etc.) to likely be employed given various levels of interest rates and the shape of the yield curve;
c. Incorporates any switching that may be necessary between portfolio and new money interest crediting methods;
d. Is what the company intends to follow within the various patterns of interest rate scenarios used for the projections given the assumed competitive environment; [Note: The ARWG recognizes the need to address the manner in which competitiveness among annuity writers affects contractholder behavior and interest crediting rates and this will be determined at a later date – see XVII below.]
e. Is consistent with the company's non-guaranteed element policy.
f. Is documented in a fashion that allows reviewers to verify its proper simulation within the projections; [Note: More work is needed here to ensure confidentiality and that the documentation of the Crediting Strategy cannot be construed as an extra-contractual guarantee.]
g. Complies with the regulatory governance requirements in effect.
h. Provide for projected credited interest rates that need not reflect investment returns from policy loans, returns on assets held to hedge contract performance guarantees, the effects of any simulated dynamic hedging within the projections, nor the return of accumulated surplus. [Note: This tentative recommendation for the effects of hedging will be reviewed in light of the conclusions ultimately reached in regard to whether hedging can be separated from normal investment activities as discussed in the note in item XV, above.]

Non-Guaranteed Elements are to be included in the models used to project future cash flows. Where Non-Guaranteed Elements are based on some aspect of experience, future changes in the level of Non-Guaranteed Elements can be determined by the model based on the experience assumed in each Scenario. The intent is to project the Non-Guaranteed Elements as the company would actually set them if experience unfolded in a manner consistent with the Scenario under consideration.

Any liability for dividends declared but not yet paid or for excess interest credits that has been established according to statutory accounting procedures as of the valuation date shall be reported separately from the Reserve described in item X by reducing the Reserve by the amount of such liability. [Note: Details regarding the way future non-guaranteed elements may be adjusted in the projection done for valuation purposes will be developed later.]

XVII. **Assumed Competitive Environment:** The Assumed Competitive Environment is a set of variables that can affect both dynamic company behavior and dynamic contractholder behavior.

The Assumed Competitive Environment reflects new-money interest rates (including bonus interest) that may be available from competing insurers or other financial institutions based on the yield curve in effect at the time credited rates are determined and its recent history.

The dynamic company behavior can include restrictions on the crediting strategy. Dynamic contractholder behavior can include withdrawal activity; transfers between accounts and allocation of premium to accounts; utilization rates of elective benefits; surrenders and partial withdrawal utilization. The behavior will be affected by market and distribution characteristics, by product characteristics such as surrender charges and bonuses, by the Assumed Competitive Environment, and by other scenario-specific factors, such as then-current credited interest rates, yield curves, and equity index levels.

Since contractholder behavior is affected by the Assumed Competitive Environment and by other scenario-specific factors, it is referred to as Dynamic Contractholder Behavior. Dynamic Contractholder Behavior shall be determined using Prudent Best Estimate assumptions.

XVIII. **Asset Segmentation:** An assignment of assets to the reserves for all business falling within scope.

a. The Asset Segmentation shall not be changed solely for purposes of reducing reserves and must be determined in keeping with the manner in which the company's business is managed.

b. A determination of who makes a certification, if one is needed, of the Asset Segmentation and Starting Assets needs to be determined.

XIX. **Taxes:** Reserves will be determined using projections that exclude Federal Income Tax in the determination of Accumulated Deficiencies.

XX. **Clearly Defined Hedging Strategy: [To be determined**]

XXI. **Model Population:** Projections may be run on a seriatim basis for assets and liabilities or by assigning contracts or individual assets to model cells in a way where the actuary can demonstrate that the results are not materially different than what would be achieved by running projections on a seriatim basis. Projected asset and liability cash flows, whether projected from model cells or on a seriatim basis, should be aggregated to the extent necessary to obtain appropriate interaction with the Investment Strategy within an Asset Segmentation. [Note, the ARWG recognizes the need to consider whether additional requirements for the actuary to support the development of model populations are needed.]

XXII. **Reflection of AVR & IMR: [To be determined]**

XXIII. **Documentation: [To be determined]**

XXIV. **Certifications: [To be determined]**

XXV. **Sensitivity Testing will be encouraged. More details to be determined.**

XXVI. **Timing (i.e., using business in force prior to year-end) will be considered and determined later.**

XXVII. **Alternative Reserve Calculation Option**: For blocks of business meeting the requirements listed below, reserves may be determined as the weighted sum of the Scenario Greatest Present Values for an insurer's Proprietary Predetermined Scenario Set instead of by the method outlined in item IV, above. [Note: the Work Group has not fully determined whether this requirement can be supported and if so, what the full requirements will be for the use of this alternative calculation option, but has nonetheless listed some of the preliminary concepts, below.]

a. Requirements for the actuary to utilize this method will be "principles-based" rather than "rules-based" to avoid having companies choose this method as a means of determining reserves which are smaller than would result under the methodology outlined in item IV.

b. A full demonstration of the adequacy of the reserves resulting from this method, along with a statement of the conditions under which such adequacy is assured, will be required to be made and documented every "n" years (such as 3).

c. The actuary will be required to certify that the conditions existing on the valuation date meet the conditions specified in the demonstration documentation.

XXVIII. **Form of requirement [to be determined]**

a. Actuarial Guideline or

b. Model Regulation

Appendix 2 – Analysis Subgroup Modeling Assumptions & Preliminary SPDA Results

These models are intended to represent an inforce block of annuity policies, although the ARWG will create and test new business models as well. The models and assumptions are intended for development and analysis of principles-based reserves within the work of the ARWG and are not appropriate or intended in any way to be used by companies in reserve modeling work or as a safe harbor. Nonetheless, the assumptions are the result of discussions within the subgroup and are intended to represent a reasonable set of assumptions to illustrate principle-based reserves. The ARWG would appreciate receiving from LHATF any feedback on this approach, the assumptions, or direction.

A2.1 Summary of Key Assumptions for Liability Only SPDA Model

A. Scenarios Tested

For initial testing we are using a level interest rate scenario. We are also testing with a number of stochastic scenarios obtained from the enhanced C3 Phase 1 generator.

B. Projection Period

All models are projecting the results monthly. The results will be projected 20 years into the future from the valuation date. Different, and possibly longer, projection periods may be more appropriate for these and other products.

C. Taxes

US Federal Income Taxes are not included in the projection. This is consistent with the other principles- based reserve approaches being developed with reserves being calculated on a pretax basis.

D. Expenses

Expenses are subtracted on a monthly basis. The timing with respect to where within each month varies by software platform. The maintenance expense is a $30 annual expense, modeled as 1/12th per month, starting at the valuation date. The overhead expense is an additional $20 annual expense, modeled as 1/12th per month, starting at the valuation date. 2% annual inflation is assumed.

E. Administration Fee

The fee is a $30 annual charge which is prorated for full surrenders. The fee is being subtracted as 1/12 per month in the projections.

F. Mortality

The mortality assumption is 100% of the Annuity 2000 Mortality Table (basic). Fractional decrements follow both exponential and uniform distributions depending upon software platform, and occur at both at the beginning and the end of each monthly period, depending upon the software platform. There is no improvement in mortality for the SPDA models, which we believe is conservative because of minimum guarantees and other product features.

G. Surrenders

1. Full Surrenders:

Rates of full surrenders vary by policy duration. Full surrenders are indicative of risk associated with policyholder behavior not tied to market or interest rate performance. Risk associated with policyholder behavior that is tied to market or interest rate performance is detailed in the dynamic surrenders section below. At the end of the surrender charge period, there is an additional shock lapse of 25% in the following policy year. The additional shock lapses are skewed non-uniformly with the majority in the beginning of the year. The shock lapse rate is not subject to the maximum lapses.

Fractional decrements follow both exponential and uniform distributions depending upon software platform, and occur at both at the beginning and the end of each monthly period, depending upon the software platform.

2. Annuitizations

Annuitizations are currently being considered as part of full surrenders. This was done intentionally to keep the initial basic SPDA model simple. We recognize that this may not be an appropriate assumption for other products.

3. Dynamic surrenders

A dynamic surrender assumption is included to reflect policyholder behavior that is motivated by having credited interest rates that may be different than what competitors are offering.

The Competitor Rate is assumed to be the 5-year Treasury rate + 50 bps. This is modeling the net competitor crediting rate that is credited to the policyholder, net of all pricing and asset related deductions. This was driven primarily by historical analysis of crediting rates with 3, 5, and 7 year Treasuries considering the duration of the surrender charge (SC) for the base SPDA product.

Excess Lapse Formula: The excess lapse formula offered here is an additive formula designed to allow for changes in policyholder lapse behavior when the relationship between the company's SPDA crediting rate and a competitor's SPDA rate changes. The value of Excess Lapse Rate will be added to the base lapse assumption (the Full Surrender Rates). The risk associated with excess lapses is market rate or interest rate changes. This dynamic relationship is modeled for three stages of relationships between competing companies.

Stage 1: The company's crediting rates are greater than competitions crediting rates.

Stage 2: The company's crediting rates are less than the competitor's rate but are also within a tolerance threshold that does not produce any additional strain on the policyholder lapse behavior.

Stage 3: The company's crediting rates are less than the competitor's crediting rate and this difference is greater than the tolerance threshold. This difference drives excess policyholder lapse behavior in Stage 3.

Proposed Formula:

Competitor Rate =	Competition's Crediting Rate
Credited Rate =	Company's Crediting Rate
Threshold =	Threshold for which policyholders are unaffected by differential in crediting rates.
Multiplier % =	The multiplier is an indication of the % of competition's crediting rates' impact on the company's excess lapses. We are using 10%.
SC Multiple =	10, to convert surrender charge to a % of protection for excess lapses.
SC Ratio =	This is the level of net SC protection. This is equal to 1 – (Cash Value / Account Value).

Stage 1 and 2 Formula:

$$\text{Excess Lapses} = (-1) * (\text{Multiplier \%} * \text{Competitor Rate}) * [(\text{Crediting Rate} - 0 - \text{Competitor Rate})^{(\text{Exponent})}] * [1-(0*\text{SC Ratio})]/100$$

Stage 3 Formula:

$$\text{Excess Lapses} = (\text{Multiplier \%} * \text{Competitor Rate}) * [(\text{Competitor Rate} - \text{Crediting Rate} - \text{Threshold})^{(\text{Exponent})}] * [1-(\text{SC Multiple}*\text{SC Ratio})]/100$$

Minimum Aggregate Lapse Rates: During the surrender change period, minimum aggregate lapse rates are 2%. After the surrender charge period, minimum aggregate lapse rates are 4%. The minimum aggregate lapse rate will be validated (or tested) at the monthly level. The monthly value of this floor will be determined consistent with the fractional decrement methodology. Both the base and the excess lapses are subject to this minimum.

Maximum Aggregate Lapse Rates: During the surrender charge period, the maximum aggregate lapse rate is 30%. After the surrender charge period, the maximum aggregate lapse rate is 50%. Both of these caps will be validated at the monthly level. The fractional value will be determined consistent with the fractional decrement assumption.

Note that in the Excess Lapses formula for Stage 1 there is a zero value where the Threshold should be and where the SC Multiple should be in Stages 2 or 3. The reason for this is to reflect that the Threshold is actually only impacting the dynamic relationship when the competition's rate is in excess of the company's SPDA crediting rate. Additionally, the SC Multiple of zero removes the dampening of excessive lapses. In both of these instances, the higher crediting rate should afford the issuing company the appropriate protection and no additional protection is afforded by surrender charges or thresholds.

H. Partial Withdrawals

Partial withdrawals are a monthly decrement based on attained age, as a percent of available free amount at the beginning of the policy year.

I. Interest Crediting

Interest credited for monthly periods follows the (1+i)^(1/12) conversion from effective rate to monthly rate. The renewal crediting rate for our product is based on the five year average of the 7-year Treasury less investment expense less default expense less assumed fixed account spread. This rate changes annually. Additionally, this value will never fall below the product minimum guaranteed rate.

J. Policy Loans

This model will ignore loans. Loans may appear in later models.

K. Distribution Channel: This product is assumed to be a non-qualified SPDA sold through a career agency. The company is a mid-sized life insurance company with a mix of business where the largest block of business is the annuity block of business.

L. Summary of Product Features

Issue Date: 12/31/2002

Maturity Date: 12/31/2041

Gender: F

Issue Age: 51

Date of Birth: 12/31/1951

Premium: $20,000

Initial Credited Rate: 4.5%

Allowable Free Partial Withdrawals: 10% of account value per year

Interest Rate Guarantee: 1 year initial period and 1 year renewal periods

Guaranteed Interest Rate: 2%

Duration	Surrender Charge	Duration	Surrender Charge
1	7.00%	5	3.00%
2	6.00%	6	2.00%
3	5.00%	7	1.00%
4	4.00%	8+	0.00%

A2.2 Numerical Results for SPDA Model

Policy Count

End of Year	0	1	2	3	5	7	10	20
Software "A"	24.000	22.615	21.278	19.996	14.967	11.068	7.476	0.000
Software "B"	24.000	22.606	21.269	19.988	14.961	11.064	7.473	0.000
Software "C"	24.000	22.607	21.272	19.992	15.022	11.118	7.490	0.000
Software "D"	24.000	22.608	21.272	19.992	14.902	10.947	7.368	0.000
Software "E"	23.999	22.605	21.268	19.988	14.953	11.053	7.467	0.000

Account Value

Duration:	0	1	2	3	5	7	10	20
Software "A"	1,000,000	969,114	937,642	906,060	679,257	533,430	388,368	0
Software "B"	1,000,000	968,926	937,690	906,321	679,893	534,224	389,269	0
Software "C"	1,000,000	969,570	938,464	907,213	684,693	537,047	391,079	0
Software "D"	1,000,000	969,062	937,930	906,654	676,588	528,162	384,411	0
Software "E"	1,000,001	971,890	943,366	914,460	691,680	547,742	405,324	0

Cash Value

Duration:	0	1	2	3	5	7	10	20
Software "A"	954,661	933,883	912,002	889,445	675,907	533,430	388,368	0
Software "B"	954,692	933,743	912,077	889,719	676,544	534,224	389,269	0
Software "C"	954,692	934,363	912,830	890,595	681,343	537,047	391,079	0
Software "D"	954,390	933,643	912,146	889,942	673,238	528,162	384,411	0
Software "E"	954,401	936,375	917,438	897,608	688,330	547,742	405,324	141,814

Account Value per Policy

Duration:	0	1	2	3	5	7	10	20
Software "A"	41,667	42,852	44,067	45,311	45,383	48,195	51,946	0
Software "B"	41,667	42,862	44,088	45,343	45,444	48,287	52,088	0
Software "C"	41,667	42,888	44,118	45,379	45,581	48,306	52,211	0
Software "D"	41,667	42,864	44,092	45,350	45,402	48,248	52,174	0
Software "E"	41,669	42,995	44,356	45,751	46,256	49,557	54,280	0

Cash Value per Policy

Duration:	0	1	2	3	5	7	10	20
Software "A"	39,778	41,295	42,862	44,480	45,159	48,195	51,946	0
Software "B"	39,779	41,306	42,884	44,513	45,220	48,287	52,088	0
Software "C"	39,779	41,331	42,913	44,548	45,358	48,306	52,211	0
Software "D"	39,766	41,298	42,880	44,514	45,177	48,248	52,174	0
Software "E"	39,769	41,424	43,137	44,908	46,032	49,557	54,280	0

A2.3 Additional Assumptions to be used for Asset/Liability SPDA Model

A. Reinvestment and Disinvestment

Initial assets within the model are reinvested in the following mix of investments. This model will use a basic bond portfolio with A and BBB quality non-callable bonds at various durations. The Coupon rates are stated as bond equivalent yield rates (BEY). The spread over the risk free rate is a bond equivalent yield rate (BEY). Free cash flows will be invested into the five year bond that reflects current scenario Treasury interest rates plus 0.80%.

Maturity Date	Coupon Mode	Book Value	Par Value	Market Value	Coupon	Statutory Yield	Default Margin	Investment Expense	Maturity
12/31/2006	Semi-Annual	50,000.00	50,000.00	49,069.54	4.70%	4.70%	0.20%	0.10%	1
11/30/2008	Semi-Annual	100,000.00	100,000.00	99,425.21	5.16%	5.16%	0.20%	0.10%	3
10/31/2010	Semi-Annual	150,000.00	150,000.00	150,574.98	5.49%	5.49%	0.20%	0.10%	5
09/30/2012	Semi-Annual	250,000.00	250,000.00	251,916.29	5.64%	5.64%	0.20%	0.10%	7
08/31/2015	Semi-Annual	300,000.00	300,000.00	303,611.77	5.83%	5.83%	0.20%	0.10%	10
07/31/2025	Semi-Annual	150,000.00	150,000.00	152,903.39	6.32%	6.32%	0.20%	0.10%	20
	Totals:	1,000,000.00	1,000,000.00	1,007,501.19	5.68%	5.68%	0.20%	0.10%	9

Disinvestment will initially be on a pro-rata basis across all assets, with other methods potentially used as determined.

B**. Defaults**

Defaults will occur at the end of each month. The default rate is .20% of book value as an annual decrement and should be modified to a monthly rate in the same manner that liability decrements are being converted.

C. Investment Expenses

Investment expenses are assumed to be .10% of book value annually, and are assumed to occur monthly.

A2.4 Assumptions for SPIA Model

This section summarizes the initial assumptions being used for modeling. A more detailed and complete set of assumptions is under development by the Analysis subgroup of the ARWG.

A. Scenarios Tested

For initial testing we are using a level interest rate scenario. We are also testing with a number of stochastic scenarios obtained from the enhanced C3 Phase 1 generator.

B. Projection Period

All models are projecting the results monthly. The results will be projected 20 years into the future from the valuation date.

C. Taxes

US Federal Income Taxes are not included in the projection. This is consistent with the other principles-based reserve approaches being developed with reserves calculated on a pretax basis.

D. Expenses

E. Mortality

The mortality assumption we are using is 100% of the Annuity 2000 Mortality Table (basic). We are not yet reflecting actual and assumed mortality improvement in initial results, but reflection of mortality improvement must be considered in the establishment of reserves.

F. Working Reserves

The working reserve for the cells being tested follow two alternative definitions of working reserves for payout annuities.

Option 1: 0 working reserves

Option 2: Present Value of future benefits at a-2000 and the 2005 CARVM Issue Year Valuation interest rate for payout annuities

Appendix 3 - Potential Simplified Treatment of Small and Low-Risk Annuity Blocks under a Principles-Based Approach

Summary of Issues

Some companies may have small blocks of relatively low-risk annuities where a simplified approach to reserve calculation would lead to acceptable results. For example, a company specializing in term life insurance may have only a small block of settlement annuities with limited liquidity and well-matched invested assets. Applying less than a fully stochastic approach involving extensive scenario testing to these settlement annuities may be justified in such a situation. The ARWG is therefore discussing whether a simplified approach can be defined for this type of annuity block and whether its use is appropriate.

There are a number of issues to resolve in addressing the need for, and feasibility of, development of such an approach, including the following:

1. How should a block of business be defined?

    a. By policy form?

    b. By broad product category (e.g. SPDA, MVA, IA)?

    c. Based on the judgment of the actuary?

    d. By NAIC annual statement exhibit totals?

2. By what measure could "small" be determined? For example, 5% of the carrier's reserves, but not more than $50 million, might qualify as small, but 10% or more than $100 million might not. Obviously, these are arbitrary judgments.

3. What products count as low-risk? Should a specific, fixed list of acceptable products be developed or should other criteria (e.g. well-defined asset-liability management strategy, periodic cashflow testing) be used to establish that a block is low-risk?

4. Should the scope of this approach be limited to specific product types issued before a cut-off date, and should the treatment extend for the life of policies inforce on that date?

5. Should the simplified treatment be phased out after a specific period (say 5 years), so that a fully stochastic approach would eventually become mandatory for all non-variable annuity business?

6. Assuming that such blocks can be identified, and the scope defined, there are a number of different approaches that could be used to calculate reserves, such as

    a. Existing CARVM Methodology using Actuarial Guidelines XXXIII and XXXV.

    b. Small Scenario Set: Test assets and liabilities using a small scenario set (e.g. 5-10 scenarios) and set reserves equal to the maximum required over all scenarios. [Note: more discussion is needed to assure this approach is distinct from using a limited number of scenarios as discussed in the section titled "Alternative Reserve Calculation Option" in the Executive Summary above.]

    c. Single Scenario: Test assets and liabilities using a single scenario that is known to lead to a conservative asset requirement.

7. Each of these approaches has some advantages and disadvantages. A few are given here by way of illustration.

    a. Existing CARVM Methodology is well understood by actuaries, but could require continued maintenance of Actuarial Guidelines and statutory valuation rates.

b. The small scenario set is consistent with principles-based approaches, but taking the maximum may be too conservative.

c. The Single Scenario approach minimizes computation, but the scenario may not be appropriate for all products.

8. Should the size of a block for qualification purposes be calculated gross or net of reinsurance? Should the risk of the block reflect non-proportional reinsurance such as stop loss?

It may be that the process of developing refined criteria for "small and low-risk block" will provide some insight into which of these approaches is preferable. The ARWG is continuing to discuss whether an approach as described here can be recommended and would appreciate receiving feedback from LHATF on this issue.