The Costs and Benefits of Converting to Lump-Sum SRBs

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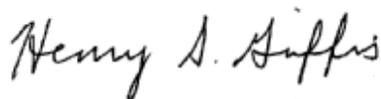
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Executive summary

The Selective Reenlistment Bonus (SRB) Program is one of the principal force-shaping tools used by the Navy and plays an essential role in mitigating retention problems in critical military specialties. It is also an expensive program: between 2000 and 2007, the Navy's expenditures on SRBs exceeded $150 million per year. It has long been conjectured that the long-term cost of the Navy's SRB program could be reduced if the service were to award lump-sum SRBs (LSSRBs) in place of the current anniversary payment SRBs (APSRBs) in which bonuses are paid in annual increments over the term of reenlistment.

The Navy could gain these savings by capitalizing on sailors' strong preferences for receiving immediate rather than deferred payment. Without changing the value that sailors place on these reenlistment incentives, the Navy could offer smaller LSSRBs at the beginning of the term of reenlistment in place of larger APSRBs that are spread across the term of reenlistment.

Although the service secretaries have had the discretion to substitute LSSRBs in place of APSRBs, the services have generally preferred to award these bonuses as anniversary payments based on the apparent belief that the prospect of receiving annual payments limits attrition among those who have taken a reenlistment bonus. In 2001, however, after almost 30 years of paying SRBs in anniversary payments, the Marine Corps transitioned to a program of LSSRBs. In 2005, the Army also adopted LSSRBs.

The Navy's N-130 asked CNA to assess the costs and benefits that would accrue to the service if it were to substitute LSSRBs for its current program of APSRBs. Our task was to look at both the net monetary gains and nonmonetary benefits associated with such a policy and to recommend whether the service should make the transition to LSSRB. Moreover, N-130 specified that, if we recommend the adoption of LSSRBs, we should identify methods that could ease the conversion to lump-sum bonuses and minimize the cost of transition.

Findings

Our analysis suggests that, should the Navy adopt lump-sum payments in place of anniversary payments for small and moderate-sized SRBs, it would likely experience significant savings over the long term. To achieve these savings, the service would have to bear increased costs in the first Program Objective Memorandum (POM) in which it transitions to lump-sum payments; these costs would be about $84 per $1,000 of APSRB. Over the long term, however, the service would enjoy a substantial internal rate of return on these expenditures—approximately 11 percent per year. (This assumes a discount rate among Navy enlisted personnel of about 20 percent and a minimal increase in attrition under a LSSRB program.)

For larger SRBs, such as those that are commonly awarded to sailors in the nuclear community, there would be much smaller returns associated with the introduction of LSSRBs, and it is possible that transitioning to lump-sum payments could actually yield a negative return. Paying large bonuses in lump sum could result in sailors bearing a significantly increased tax liability (compared with spreading the SRB payments across multiple years), and the Navy would have to adjust its SRB payments to offset this increased liability if it is to retain these sailors. Moreover, as we will explain in more detail, it is likely that servicemembers would apply a lower discount rate when they consider the value of shifting larger bonuses across time, and this would also lower returns on the introduction of large LSSRBs.

Beyond the monetary benefits of substituting LSSRBs for APSRBs, transitioning to lump-sum bonuses would have important consequences for how the SRB program is administered in different circumstances. On one hand, under an APSRB scheme, the Navy often starts the fiscal year with a substantial overhang of obligations from the past—anniversary payments that are due for reenlistment bonuses contracted in previous years. Because the service is obligated to make these payments, any reductions in the SRB bonus budget for a given year (such as that which would be experienced during an economic downturn) must come out of new APSRB obligations for that year. As a result, seemingly small reductions in overall SRB funding can have big effects on a service's ability to offer new bonuses.

On the other hand, an APSRB scheme can also provide greater administrative flexibility when the economy is heating up. During times of economic expansion, the service often finds that its SRB budget is insufficient to attain its retention goals. Moreover, there is often a

substantial delay before SRB budgets are increased to necessary levels, and services are often forced to overspend their SRB appropriations. Paying SRBs in anniversary payments, rather than in lump sum, allows the service to offer SRBs to more personnel (for any amount of expenditure in excess of appropriations) and therefore make the most of its limited SRB budget during times of economic expansion.

Recommendations

The principal recommendations from our analysis include the following:

- Implement a program in which at least some APSRBs are converted to LSSRBs. Such a program is likely to have a large return on investment (an internal rate of return of approximately 11 percent).

- Begin this program on a pilot basis, offering LSSRBs first to servicemembers who are reenlisting for relatively small bonuses, or to shorter terms of reenlistment. As we explain later, these sailors are likely to have discount rates that are higher than average, and converting their bonuses to LSSRBs is likely to produce larger cost savings.

- Monitor the results from this pilot program and ensure that, in converting to LSSRBs, there is only a minimal increase in attrition and any changes in the characteristics of those who reenlist (age, family composition, race, Armed Services Vocational Aptitude Battery (ASVAB) score, promotion timing, etc.) are not problematic for the service.

- Introduce the LSSRB program as a menu of options from which the servicemember could choose. These options should be more comprehensive than just a binary choice between LSSRB and APSRB but should be designed so that the service can meet its retention goals at least cost.

- As part of the pilot program, the Navy should develop informational material that would help servicemembers understand the tax implications of choosing LSSRBs over APSRBs (or choosing one of the other options they are offered).

If, as expected, the pilot program proves to be successful—if it is easy to administer and meets the service's retention goals at a significantly reduced cost—the service should expand the flexibility to choose from the LSSRB menu to all sailors who are eligible for SRBs.

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Background and policy issues

The Selective Reenlistment Bonus Program was established by Congress in 1974 as a compensation tool for addressing short-term retention problems in critical military specialties.[1] Through most of their history, these bonuses have been paid out in increments: an initial payment of 50 percent is made at the time of reenlistment and the remaining 50 percent is paid out in equal annual installments over the term of reenlistment.[2] The service secretaries, however, have discretion over the form in which these bonuses are to be paid, and in recent years two of the services (the Marine Corps and the Army) have moved to lump-sum payment of SRBs.[3] CNA was asked by N-130 to assess whether the Navy could also benefit were it to substitute lump-sum SRBs (LSSRBs) for anniversary payment SRBs (APSRBs).

The principal incentive for moving to LSSRBs is that, under this payment scheme, the service would be able to retain enlisted personnel with less costly bonuses. In general, enlisted sailors have a strong preference for receiving payment in the here and now (rather than as deferred income), and this preference means that, were the Navy to move from anniversary payments of SRBs to lump-sum SRBs, it could provide sailors with smaller LSSRBs that would leave the servicemembers just as well off as more costly APSRBs.[4]

The principal argument *against* paying out lump-sum SRBs is that the prospect of receiving anniversary payments acts as an incentive for sailors to remain in the service—that these periodic payments dissuade servicemembers from taking a reenlistment bonus with the intention of leaving the Navy before the completion of their obligated service. The usefulness of this incentive arises from the fact that the Navy does not

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[1] In the Navy, SRBs are generally defined by rating and zone, but they may also be differentiated by sailors' Navy Enlisted Classifications (NECs).

[2] It appears that between 1979 and 1982 at least some of the services issued SRBs in lump-sum payments. It is unclear, however, how widely this policy was adopted.

[3] The Marine Corps adopted lump-sum payment of SRBs in 2001; the Army did so in 2005.

[4] One possible reason for this preference is that people don't want to delay gratification. However, the preference may also arise from people being credit constrained and wishing to use cash up front for large, essential purchases (e.g., a car).

recoup SRBs that are paid out to sailors who attrite before completion of their terms of reenlistment.[5]

In our analysis, we assess the net monetary benefits of substituting LSSRBs for APSRBs, weighing the savings associated with paying smaller bonuses against the costs associated with increased attrition. We also consider the time profile over which these costs and benefits would accrue and evaluate the internal rate of return associated with transitioning to LSSRBs. While adopting lump-sum payment of SRBs would yield long-term savings for the Navy, these savings would only be gained if the service were willing to assume near-term costs; our calculations address the return on investment (ROI) on these near-term costs.

We also consider important administrative aspects of the SRB program that would be affected by the adoption of LSSRBs. In substituting LSSRBs for APSRBs, it would become easier for the service to manage SRBs during periods of economic downturn, but the Navy could lose flexibility in managing SRBs during economic upswings. We also discuss how the Navy might limit the costs and administrative difficulties associated with transitioning to LSSRBs, and we consider both methods for limiting the near-term costs of this initiative and approaches to phasing in lump-sum bonuses at the most propitious time.

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[5] Any monies that are recovered accrue to the General Fund of the Department of Treasury, but there is anecdotal evidence that little of the monies are recovered.

Monetary benefits and costs of adopting LSSRBs

The principal monetary *benefit* of shifting to LSSRBs: The ability to offer smaller SRBs

The potential savings associated with the introduction of LSSRBs arise from a frequently observed phenomenon: young, working-age people strongly prefer to receive their income in the here and now rather than in deferred installments. The sailor's preference for current income over future income means that, were the Navy to move from anniversary payments of SRBs to lump-sum SRBs, the service could pay the sailor a smaller SRB. As a simple example, a young sailor might be indifferent between receiving $0.75 at present and receiving a guaranteed payment of $1 one year in the future. Under such a circumstance, for every dollar the service shifts from an anniversary payment one year in the future to a lump-sum payment in the present, the Navy could save $0.25 without any loss in the sailor's perceived value of the SRB.[6]

The principal monetary *cost* of shifting to LSSRBs: A smaller incentive to remain in the service

The principal argument for paying SRBs in anniversary installments is that the prospect of receiving these periodic disbursements will encourage sailors to remain in the service and complete their terms of enlistment. If, instead of installments, all SRBs were paid in a lump sum at the beginning of a sailor's contract period, there might be an increase in the number of servicemembers

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[6] The example is somewhat simplified because it ignores the government's ability to save and borrow with interest: if the government is able to earn a positive return on payments deferred to the future (perhaps by buying its own bonds), the present value of savings in our example would be less than $0.25. In the current economic environment, however, the government's return on savings is close to zero, and, as a result, this factor has little effect on the savings that will accrue from shifting from APSRBs to LSSRBs. There are other examples in this analysis in which the government's cost of funds is ignored in order to improve exposition. However, this value is included where appropriate in calculations of return on investment.

who would take the SRB and depart the Navy before completing their obligated service. The reason for this is that, at present, there is little recoupment of bonuses (either enlistment bonuses or SRBs) from sailors who take these payments and then fail to complete their enlistments. In effect, sailors are able to "take the money and run."[7]

Not only might shifting to LSSRBs increase the number of servicemembers who leave the Navy without finishing their enlistments, the policy change would also increase the financial loss that the service suffers with each departure. Under APSRBs, when sailors depart the service without completing the terms for which they were paid bonuses, the Navy pays out the initial payments (50 percent) made at the beginning of the enlistments as well as any anniversary payments that were made before the servicemembers' departure. Under this scheme, however, sailors do not receive any of the anniversary payments that would have been paid after the servicemembers' departure. In contrast, were the Navy to shift to LSSRBs, sailors who leave early would depart with their entire SRB.

Assessing the monetary tradeoff on a sailor-by-sailor basis

At this point, it is instructive to weigh the principal monetary benefits and costs associated with introducing lump-sum SRBs and to assess the net savings that might arise from offering *a representative sailor* an LSSRB instead of an APSRB. We will find that, under most likely circumstances, an LSSRB would result in net savings over an APSRB for a representative sailor. Later in this analysis, however, we consider other administrative and budgeting issues that will greatly affect the service's ability to realize the savings associated with the adoption of LSSRBs; we will find that, in many instances, these additional considerations could make it more difficult (and costly) to transition from APSRBs to LSSRBs.

We will assess the present value of the net savings of moving from APSRBs to LSSRBs for several hypothetical sailors who have a range of discount rates and who are considering reenlisting to new contracts. To make the math in these examples as transparent as possible, we assume that each of these sailors currently requires total SRB payments of $1,000 (paid

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[7] The Navy does not recoup any funds from those who have taken an SRB but departed the service before completion of their obligated service. Whatever funds are reclaimed accrue to the general fund of the Department of Treasury.

over the length of the new service contract) to reenlist. We also make the following additional assumptions:

- Sailors are considering reenlistment to 5-year contracts (later, we relax this assumption and consider those who reenlist to different terms).

- Some proportion of SRB-eligible sailors will take the SRB with good intent but will, for reasons outside their control, leave before the end of the contractual obligation. Because there is no discretion involved with these departures, we assume that the proportion of defaults is the same under anniversary payments and under lump-sum SRBs. In this example, we set these losses at 3 percent per year. This is consistent with the level of losses we find in the Enlisted Master Record among sailors who take an APSRB but depart before completing their obligated service.

- Some proportion of SRB-eligible sailors who plan to leave the Navy will take the SRB with the expectation that they will leave the service shortly after receiving the bonus, and that they will not pay back whatever SRB payments they receive. *These personnel do not count as increased attrites; they would leave the service regardless of how the Navy pays SRBs.*[8] However, given the larger upfront payment under an LSSRB program, we assume there are 25 percent more of such personnel. We also assume that, in transitioning from APSRBs to LSSRBs, these losses would rise from 2 percent of the cohort eligible for receiving SRBs to 2.5 percent. We assume that all of these losses occur in the year immediately after the bonus is paid. (In a later section, we show that these losses are not a major driver of the net benefits (net costs) associated with a transition from APSRBs to LSSRBs.)[9]

- The government's real cost of borrowing (adjusting for inflation) equals the real return it can earn on saving (again, adjusting for inflation), and we set this equal to 3 percent. Following the Government Accountability Office (GAO, 2011) [1], we used the

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[8]   Later in this analysis, we consider how adopting LSSRBs might increase attrition.

[9]   Our assumptions concerning the current level of attrition are consistent with what one observes in the data. Our assumption that there will be a ½-percent rise in fraudulent collection of SRBs among those planning to depart the service is rather arbitrary. Later in this analysis, however, we estimate the IRR of transitioning to LSSRBs under a broad range of estimates for this variable and we demonstrate that this variable is not a major driver of the net benefits (net costs) associated with a transition from APSRBs to LSSRBs.

average of the 3-month Treasury Bill and 10-year Treasury Note rates as forecast by the Congressional Budget Office (CBO) (5.4 percent), minus the level of inflation forecast by the CBO (2 percent). This provides a real cost of funds of 3.4 percent.

- Any change in the way SRBs are paid will have no effect on sailors' marginal tax rates. Later in this analysis, we discuss this assumption and illustrate that, for some sailors, their tax position can have a significant impact on the value of LSSRBs.

- A servicemember's time preferences for money (the extent to which a sailor prefers to receive money in the present rather than in the future) can be represented with a single value—the discount rate. If this parameter has a value of 0, it implies that the sailor is indifferent between receiving $1 at present and a guaranteed $1 a year from now; if the parameter is 1, a sailor would be indifferent between receiving $1 now and $2 a year in the future; and, if the parameter is equal to infinity, a sailor would be indifferent between receiving $1 at present and an infinite amount one year hence. In appendix A, we discuss how certain aspects of people's behavior that run contrary to this assumption can have important implications for the implementation of LSSRBs (e.g., it appears that a single discount rate does not capture people's time preferences for both large and small sums of money).

- The Navy has some method for identifying sailors' time preference for money (the extent to which sailors prefer income in the here and now), and the service would be able to capitalize on this preference by offering smaller LSSRBs than APSRBs.

Some preliminary findings

In this subsection, we examine three of the principal financial considerations that would be involved in moving from APSRBs to LSSRBs:

- *The extent to which the Navy could reduce the amount it pays in bonuses while maintaining reenlistments.* Again, the service's ability to reduce SRBs would be based on sailors' preferences for receiving all of an SRB at the beginning of the term of enlistment, rather than as periodic payments throughout the enlistment period.

- *The extent to which the service would suffer greater financial losses when sailors depart the Navy without completing their obligations.*

Those who depart under LSSRB would retain their entire bonus, whereas those who depart under the current APSRB scheme miss out on those anniversary payments that would have been paid after their departures.

- *The likelihood that there would be greater abuse of SRBs from personnel who would take bonuses intending not to complete their enlistment.* As we discussed earlier, raising the amount that is paid out at the beginning of the enlistment would increase the incentive for this type of fraud.

We have estimated the net savings that would result from replacing a $1,000 APSRB with an LSSRB that would be of equal value to a sailor, conditional on (a) the assumptions outlined earlier and (b) a set of hypothesized discount rates for our representative sailor. Figure 1 shows the net savings that would accrue for discount rates ranging from 0 to 50 percent. We see that the savings that would result from moving to LSSRBs increase with a sailor's discount rate; this makes sense because the greater a servicemembers preference for income in the here and now, the more the Navy can capitalize on this preference by reducing the size of LSSRBs relative to APSRBs.

Figure 1. Net savings by discount rate from changing a $1,000 APSRB to a (smaller) LSSRB
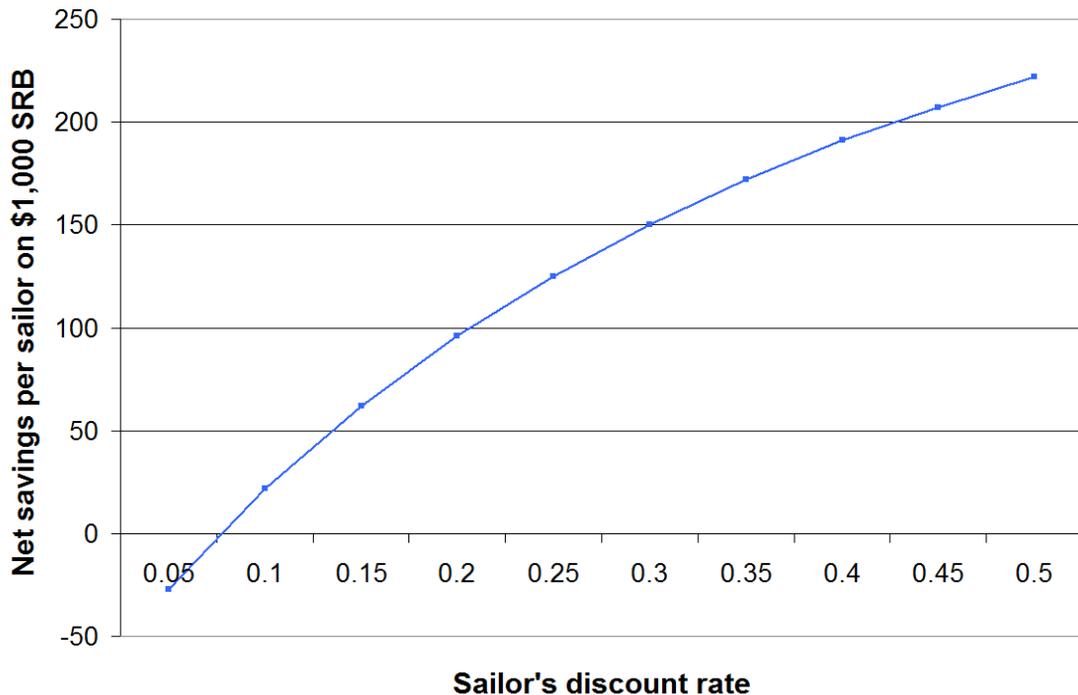
Under the assumptions specified, the service would enjoy a net savings from shifting a single sailor from APSRB to LSSRB if the sailor's discount rate is at least 7.5 percent (and, as we discuss later, we can expect the great majority of servicemembers to have discount rates that are at least this high).

We see that, if our representative sailor has a very low discount rate (less than 7.5 percent), the service would experience a loss from shifting from APSRB to LSSRB. The reason for this is that the Navy would not be able to reduce the size of the SRB by very much (the sailor would be close to being indifferent between current income and future income, so the service would have to maintain the size of the SRB at close to its current level if it wishes to retain this servicemember). Whatever small savings might be enjoyed from a reduction in the SRB would be more than offset by an increase in financial losses arising from an increase in the number of fraudulent attrites and from each attrite departing with a larger portion of the SRB.

Example. Deriving numbers for a sailor with a discount rate of 20 percent.

In appendix A, we argue that the most likely discount rate for a representative sailor is about 17 percent to 20 percent. A servicemember with a 20-percent discount rate, who is signing a 5-year contract in exchange for a $1,000 APSRB, would be just as happy if he or she were to receive an LSSRB of $824—and we assume that this is the amount of LSSRB that the Navy offers this servicemember.

The difference between the face value of the two contracts is $176 ($1,000 - $824), but the actual net present value of the savings is less. This is because the Navy would not have to pay the full $1,000 to provide a sailor with a $1,000 APSRB. We have assumed that the government can earn a real interest rate of 3 percent per year on any monies that are transferred from the current year into a future year. As a result, the service would have to set aside only $965 at present to provide $1,000 in APSRBs over the 5-year contract.[10] This implies that the present value of the difference between the APSRB and the LSSRB would be $141 ($965 - $824).

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[10] For a 5-year contract, sailors are paid an initial payment worth 50 percent of the SRB's value, and 4 subsequent anniversary payments (each of which is worth 12,5 percent of the SRB's value). These anniversary payments are typically paid out shortly after the beginning of the fiscal year.

These savings will be partially offset by the fact that our well-meaning attrites (those who leave the service for reasons outside their control) will depart the service with larger portions of their SRBs. In the first year of the new enlistment, 3 percent of those who took the SRB would depart with their full SRB amount. Under APSRB, they would have left with their $500 initial payment but without any of their anniversary payments (which have a present value to the Navy of $465). Under LSSRB, these sailors would depart with their full SRB of $824. The net present value of this loss, weighted by the 3-percent likelihood of the loss is (0.03)*($465) = $13.95. When we consider those 3 percent of reenlistees who would leave in the second year of their contract (without forfeiting the remaining 3 years of anniversary payments), the 3 percent who would leave in the third year (without forfeiting 2 years of anniversary payments), and the 3 percent who would leave in the fourth year (without forfeiting 1 year of anniversary payments), the total present value of these types of losses would be $34.

Finally, the Navy would also likely suffer greater losses from abuse of SRBs. We have assumed that, under APSRB, 2 percent of the SRB-eligible personnel take the bonus with the intention of leaving the service and not reimbursing the Navy for the bonus. We have assumed that, under LSSRB, an additional 1/2 percent of SRB-eligible personnel would abuse the system in this way. The fact that the current abusers would take more from the system (they would walk away with the entire SRB), together with the increase in the number of abusers, would result in another $11 in present value net losses.

In total, the present value of the net savings that the Navy would experience from shifting from APSRB to LSSRB (assuming that our sailor's discount rate is 20 percent) is the net present value of the APSRB contract less the net present value of the LSSRB contract and the cost due to the additional attrition, or $965 - $824 - $34 - $11 = $96. Note that, in shifting to LSSRBs, the difference between the government's cost of funds (returns on savings) and the sailor's discount rate would produce savings of about 15 percent ($141/$965) of the cost of the APSRB. However, about a third of these savings would be eliminated (offset) by greater losses from (a) abuse of SRBs and (b) attrites taking more of their SRBs when they depart the service (these offsetting losses would be equal to $34 + $11 = $45).

Trying to effect savings within the POM budget horizon

In the previous subsection, we examined the effects of moving from APSRB to LSSRB for a representative sailor and found that, under what we consider to be the most reasonable assumptions concerning the discount rates of servicemembers, this policy shift would result in substantial savings for the Navy. Here, we consider the immediate net savings that would occur within one (6-year) POM budgeting cycle were the service to implement this policy change for multiple sailors. Perhaps paradoxically, we find that the service would have to bear a substantial *increase* in SRB costs in the initial POM in which it transitions from APSRB to LSSRB. In other words, although shifting from APSRB to LSSRB would reduce the Navy's SRB costs over an infinite planning horizon, the service would have to bear greater costs within the first 6-year POM budget period in which the plan is implemented.

The reason for this seemingly counterintuitive result is that, in shifting from APSRBs to LSSRBs, the service would experience greater costs in the initial years, but more than offsetting savings in the out-years. If we consider all costs and savings over an infinite horizon, the policy change would result in a net savings to the service. Within the more limited time horizon of the POM budget, however, many of the savings that would result from the introduction of the LSSRB would occur after the last (6th) year of the budget and, therefore, would not be counted as savings in that initial POM.

We illustrate this important point with a multistage thought exercise that builds on the previous example. The first stage of this exercise is to calculate the present value of the savings that would occur *in each year of a 5-year contract*. These costs are shown in table 1:

- Column 2 is the present value (PV) of the costs of a $1,000 APSRB by year.

- Column 3 shows the present value of the costs of an LSSRB (of equivalent value) by year.

- Column 4 indicates the higher costs under LSSRB resulting from the greater number of attrites and the fact that each attrite departs the service with more bonus money. (These costs are expressed in PV.)

- Column 5 shows the net combined effects of eliminating the APSRB and replacing it with an LSSRB.

The *rows* in this table indicate the net present value of savings (costs) by contract year that would result from shifting from APSRB to LSSRB. The first row of this table (labeled "year 1") indicates that, if we consider only the period when the contract is signed (and ignore all subsequent periods), making this policy shift would result in a net loss to the Navy of $335. (Again, this loss results from the service frontloading the SRB to the beginning of the contract.) Over subsequent years, we see significant savings from shifting to an LSSRB because the service is no longer making anniversary payments. Over time, these savings offset the initial, higher costs of the LSSRB and, by the end of year 5, there is a total savings of $96.[11]

Table 1. The present value of costs associated with a $1,000 APSRB and an LSSRB of equivalent value, for a sailor with a 20-percent discount rate, by each year in a 5-year contract

(1) Year of contract	(2) PV of annual cost of APSRB payments	(3) PV of annual cost of LSSRB payments	(4) PV of added costs for attrites	(5)=(2)-(3)+(4) Difference in PV of annual payments
1	$500	$824	$11	- $335
2	$121	$0	$14	+ $107
3	$118	$0	$10	+ $108
4	$114	$0	$7	+ $107
5	$111	$0	$3	+ $108
Total	$965	$824	$45	$96

The net savings in the first POM budget

The second stage of our thought exercise is to calculate the net savings (costs) that would occur over a 6-year POM budget as a result of shifting from APSRBs to LSSRBs. To make our results as clear as possible, we assume that the service issues only one SRB per year. This is illustrated in table 2, where we see a notional POM budget for the period of 2013 to 2018 in which a total of six SRBs are issued.

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[11] An APSRB for a 4-year contract will involve payments in four fiscal years. If the initial payment is made in 2013, the first anniversary payment would be made on the first day of the next fiscal year (October 1, 2014). Anniversary payments would be made in each of the two following years (2015 and 2016).

Table 2. The net savings (costs), over a 6-year POM budget period, resulting from adopting LSSRBs in place of APSRBs (assuming that one SRB is issued per year)

		Budget Year					
		Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
Year	2013	-335					
Year	2014	107	-335				
Year	2015	108	107	-335			
Year	2016	107	108	107	-335		
Year	2017	108	107	108	107	-335	
Year	2018		108	107	108	107	-335
Total Savings (Costs)		95	95	-13	-120	-228	-335

(The "Time" label appears vertically along the left of the row-year column.)

The first two columns of this table show the present value, by year, of the net savings for the first two LSSRBs (one issued in 2013 and the other in 2014). Both of these bonuses would be paid out within the 6-year POM budget; as a result, the Navy would experience the full $96 savings that could result from shifting to LSSRBs. However, all the subsequent bonuses (those initiated in 2015 and later) would not be fully paid out during the 6-year POM budget period and, as a result, during this POM the service would not experience all of the savings that could result from issuing LSSRBs in place of APSRBs. In fact, for the last three LSSRBs (those issued in 2016, 2017 and 2018), the service would experience substantial negative savings (positive costs) because few of the out-years for these three SRBs are included in the 6-year POM period. In this example, the net savings associated with shifting from APSRBs to LSSRBs across all of the 6 years in the POM budget is –$506 (= 95 + 95 - 13 - 120 - 228 - 335), or a net *cost* of $506.

The essential point of this example is that, although the Navy could enjoy substantial savings *in the long term* from transitioning from APSRB to LSSRB, the service could experience significantly greater costs in the first POM budget period in which LSSRBs are introduced. The amount of additional costs that the service would have to bear in this first POM would, of course, be a function of sailors' discount rates in that higher discount rates

mean that the service could offer lower LSSRBs. Figure 2 shows the relationship between sailors' discount rates and the cost of transitioning to LSSRBs during the first POM period in which LSSRBs are introduced.

In figure 1 we saw that, over the long term (and under the assumptions specified in our example), there would be net savings from transitioning to LSSRBs if sailors' discount rates were greater than 7.5 percent. In contrast, figure 2 shows us that, in the first POM budget in which LSSRBs are introduced, the service would bear increased costs unless sailors' discount rates are greater than 36 percent (and we argue later in this study that it is highly unlikely that the average discount rate among sailors is as high as this).

Figure 2.   Net savings of replacing $1,000 APSRBs with LSSRBs (assuming a 6-year POM budget cycle, reenlistment for 5-year contracts, and one SRB issued each year)
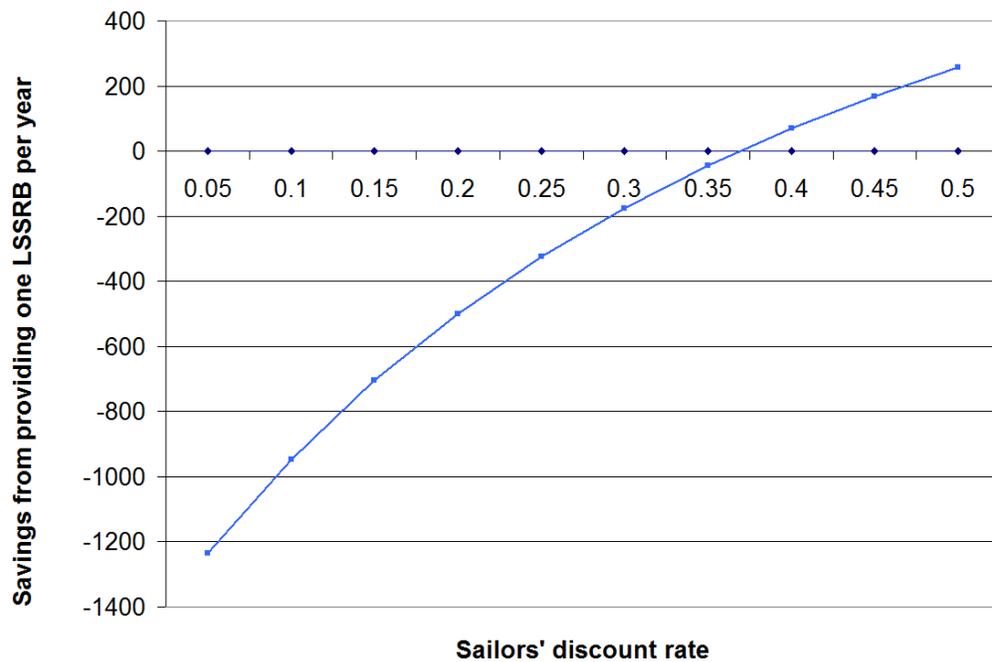
We see that, if our representative sailor has a discount rate of 20 percent, the Navy would have to bear costs of $506 to replace six $1,000 APSRBs with LSSRBs. This implies that in the first POM in which it transitions to LSSRBs, the Navy would have to bear costs of about $84 per $1,000 of APSRB ($506/6).

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The net savings in subsequent POM budgets

Extending our example a little farther, we can show that in each subsequent 6-year POM budget (e.g., that covering 2019 through 2024), the service would enjoy the full benefits of transitioning to LSSRBs: assuming a 20-percent discount rate, these benefits would equal $576, which is equal to $96 (the benefit accruing from converting each APSRB to an LSSRB) times 6 (the number of years of the POM budget). In this second POM budget, the service would again fail to realize some of the savings associated with the LSSRBs issued during that POM, but these unrealized savings would be exactly offset by savings generated from the LSSRBs issued in the first POM period—savings that did not accrue until the second POM period. Therefore, the negative savings would only last for the first POM cycle.

Could adopting LSSRBs be worthwhile?

A first take on calculating the IRR for adopting LSSRBs

In replacing APSRBs with LSSRBs, the Navy would have to bear costs in the initial POM in order to gain the ultimate savings that would result from the policy change. This raises the question of whether these expenditures would be a worthwhile investment. The standard method for addressing this question is to calculate the policy's internal rate of return (IRR), which relates an undertaking's costs to its benefits. More precisely, the IRR is the interest rate that brings a series of expected cash flows (positive and negative) to a net present value (NPV) of zero. For any given level of investment risk, those initiatives that have a higher IRR are more desirable. A standard rule of thumb in investment management is that riskier investments must be justified by higher IRRs.[12]

The numbers presented earlier in this discussion provide us with the information we need to calculate the IRR associated with replacing APSRBs with LSSRBs.[13] In the example, we calculated the costs and savings that result from replacing a single APSRB of $1,000 with an LSSRB of equal perceived value. In table 2, column 1, we showed that the net savings (costs) by year were -$335, $107, $108, $107, and $108. This would suggest an IRR of 11 percent.[14]

Table 3 shows the internal rates of return of converting an APSRB to an LSSRB as a function of the discount rate of the average sailor (or, more appropriately, the median sailor). The table shows that the IRR of

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[12]   Another rule of thumb is that one should undertake any risk-free investment with an IRR greater than zero (if the cost of funds has been integrated into the calculation of IRR).

[13]   In general, there is no closed form solution for the IRR: its value must be found iteratively. However, there are many readily available software applications that calculate these values, including Microsoft Excel.

[14]   Equivalently, we could calculate the IRR from the costs and savings across POMs. This calculation is more complex, however, because it requires discounting monies within the POM.

transitioning to LSSRBs is very sensitive to sailors' discount rates. (These estimates of IRR are conditional on all the assumptions specified in the examples presented earlier in this analysis.)

Table 3.   The internal rate of return of converting a 5-year APSRB into a 4-year LSSRB, as a function of sailors' discount rates

The discount rate of the median sailor	IRR
0.05	-0.02
0.10	0.02
0.15	0.07
0.20	0.11
0.25	0.15
0.30	0.20
0.35	0.24
0.40	0.28
0.45	0.33
0.50	0.37

Net savings under longer term reenlistments

The savings from converting to LSSRBs are greater for longer reenlistment contracts, but the costs are greater, too.

The previous examples were all based on the assumption that sailors were reenlisting for a 5-year term. We now consider what the costs would be of transitioning to LSSRBs for longer term reenlistments. We will show that, when we are looking over an infinite horizon, there would be *greater savings* associated with introducing LSSRBs for longer term contracts. However, when we are estimating savings (costs) for the first 6-year POM budget period in which we introduce LSSRBs, we find that, ceteris paribus, the service will bear *greater costs* when sailors are reenlisting for longer periods.

Figure 3 compares the savings that would accrue, for both 5-year and 6-year reenlistment contracts, from replacing a single APSRB of $1,000 with an LSSRB (conditional on the assumptions we specified in the example). We again assume that, in replacing a $1,000 APSRB, the service is providing the sailor with an LSSRB that is perceived to be equal in value to the APSRB (based on the servicemember's discount rate). The figure illustrates that, for any discount rate above 7 percent, transitioning to

LSSRBs would yield greater savings when sailors are reenlisting to the longer, 6-year contract. The logic behind this is straightforward: the longer the sailor's reenlistment contract, the greater the delay sailors would experience in receiving the full payments of an APSRB, and the less the Navy would need to offer in a lump-sum SRB in order to leave sailors just as well off as under the APSRB.[15]

Figure 3. Net savings by discount rate from moving a $1,000 APSRB to a (smaller) LSSRB: comparing 5- and 6-year contracts
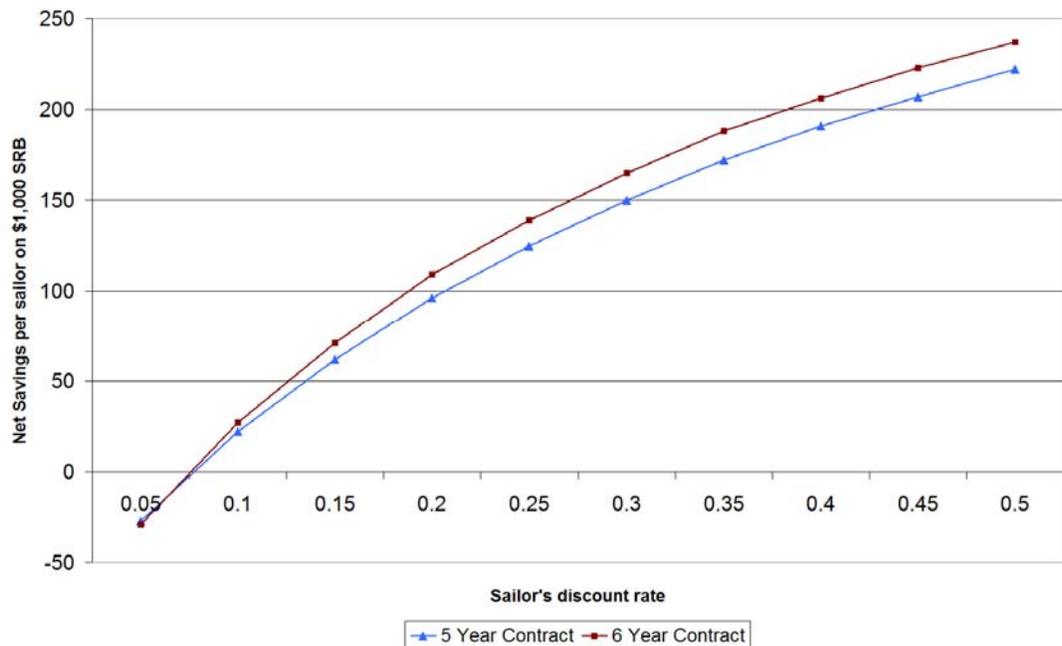
As in the case of the 5-year contracts, the service is likely to bear significant net costs in the first POM budget in which it offers LSSRBs for 6-year contracts. In fact, as we illustrate in figure 4, for any given value of APSRB and for the most probable discount rates, the service would bear greater costs from transitioning to 6-year LSSRBs than 5-year LSSRBs. The reason is that, because of the greater

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[15] At very low discount rates (less than 7 percent), there would be negative savings (positive costs) from transitioning to LSSRBs, and the costs from 6-year reenlistments would be slightly greater than for 5-year contracts. This is because, under the longer contract, more SRB recipients would leave the service (the departures that would occur in the 5th year of the longer contract) and, under the LSSRB, each of these sailors would take with them more bonus money.

length of the contract for which the LSSRB is offered, fewer of the out-years for these LSSRBs occur within the POM budget period.

Figure 4. Net savings of replacing $1,000 APSRBs with LSSRBs (assuming a 6-year POM budget cycle, and one SRB issued each year)
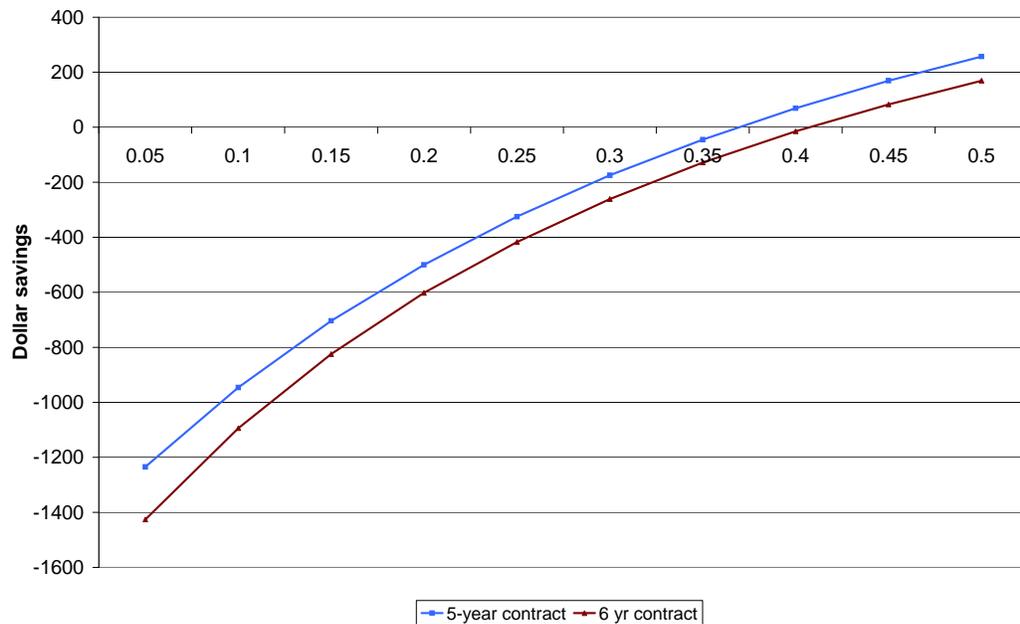
The IRR of converting from APSRBs to LSSRBs does not vary with the length of the reenlistment contract

When we consider figures 4 and 5 together, we see that, although there are greater long-run *savings* generated from 6-year LSSRBs than from 5-year LSSRBs, there are also greater short-run *costs* associated with the 6-year LSSRBs that must be borne in the first POM. This raises an obvious question: how does the IRR of converting a 6-year APSRB compare with the IRR of converting a 5-year APSRB? It turns out that the IRR for converting APSRBs to LSSRBs does not vary with the length of the contract with which the SRB is associated. This implies that the IRR values shown in table 3 apply to contracts of all lengths.

Evaluating our assumptions

Up to this point, our discussion of the desirability of adopting LSSRBs in place of APSRBs has been predicated on a set of assumptions regarding a number of factors, including sailors' discount rates, the government's cost of funds, the marginal tax rates among SRB recipients, the proportion of current attrites (sailors who currently take SRBs but who depart the service before

the completion of their contracts), and the increase in attrites we would observe among SRB recipients under an LSSRB scheme (as we discussed, there would be increased incentive for fraudulent behavior under an LSSRB scheme).

For most of these factors, we can use available data to ensure the reliability of our assumptions (e.g., the government's cost of funds and the proportion of sailors who currently attrite). There are three assumptions, however, about which we are less certain: (2) the increase in attrition we would observe under an LSSRB scheme, (2) servicemembers' marginal tax rates, and (3) sailors' discount rates. In the next few subsections, we describe what data are available on these factors, discuss in detail the assumptions we have made about these factors, and examine whether these factors play a critical role in driving our findings and recommendations.

The proportion who would take the SRB with fraudulent intent

Among the factors that drive the likely costs and benefits of converting from APSRBs to LSSRBs, the rise in fraudulent use of SRBs may be the most difficult to predict. Neither the Marine Corps nor the Army could provide us with precise data on how losses changed among SRB recipients after these services converted to LSSRBs. (Even if such data were available from the other services, it would be unclear whether this information would provide much insight into how Navy personnel would respond to the introduction of LSSRBs.) We can demonstrate, however, that any likely change in the fraudulent use of SRBs would have only small effects on the benefits associated with adoption of LSSRBs.

The costs and benefits of adopting LSSRBs that we derived in our earlier examples were predicated on the assumptions that (a) 3 percent of those who take the SRB attrite each year for reasons outside their control, (b) 2 percent of those who are eligible for SRBs will take the bonus with the intent of leaving the service and retaining the bonus, and (c) there will be a ½-percent increase in this sort of fraudulent behavior after the service adopts LSSRBs. Our first two assumptions correspond to the current levels of attrition that we observe among those who currently receive SRBs (of course, we cannot tell from the attrition data whether, when sailors sign a reenlistment contract, attrite, and retain their SRB, they had intended to commit fraud at the time of their reenlistment or had attrited for reasons outside their control).

Table 4 shows that adopting LSSRBs would have a substantial IRR even if the Navy were to experience much larger increases in the fraudulent use of SRBs. The fourth row of this table shows the IRRs associated with adapting LSSRBs if the discount rate of the median sailor is 20 percent and the increase in fraudulent receipt of SRBs lies between ½ of a percent and 10 percent. We can see that if fraudulent claims for SRBs were twice what we expected (if it were 1 percent) or 4 times what we expected (if it were 2 percent), the IRR of adopting LSSRBs would fall to 10 percent or 9 percent, respectively (assuming a 20-percent discount rate). These are still very respectable levels of IRR.

Table 4. The IRR of adopting LSSRBs in place of APSRBs, as a function of sailors' discount rates and the increase in the fraudulent receipt of SRBs (assuming no increase in sailors' marginal tax rates)

Sailor's Discount Rate	With additional fraudulent departures				
	0.005	0.01	0.02	0.05	0.1
0.05	-0.02	-0.03	-0.4	-0.06	-0.09
0.1	0.02	0.02	0.01	-0.02	-0.05
0.15	0.07	0.06	0.05	0.02	-0.02
0.2	0.11	0.1	0.09	0.06	0.02
0.25	0.15	0.15	0.13	0.1	0.05
0.3	0.2	0.19	0.18	0.14	0.08
0.35	0.24	0.23	0.22	0.18	0.12
0.4	0.28	0.28	0.26	0.21	0.15
0.45	0.33	0.32	0.3	0.25	0.18
0.5	0.37	0.36	0.34	0.28	0.21

Net savings when LSSRBs shift sailors to higher tax brackets

Transitioning to LSSRB from APSRB could have significant tax implications for servicemembers because it would replace multiple payments—spread over multiple years—with a single payment received in a single year. Although the *sum* of the payments under APSRBs would be greater than the lump-sum payment that the service would offer in its place, concentrating the lump-sum payment in a single year could push the servicemember into a higher tax bracket during that year and increase the total taxes that he or she would have to pay on the bonus. In such a case, the servicemember might perceive less benefit from receiving the bonus as a lump sum, and the Navy might not be able to offer as small an LSSRB as it could in the absence of an increase in the marginal tax rate.

One must consider numerous factors in calculating how taxes could affect the savings the service derives from replacing APSRBs with LSSRBs. Reference [2] (CBO, 2005) considers a range of these factors and estimates the marginal tax rates and average tax rates for persons at different income levels and with different filing statuses (single, married filing jointly, etc.). The most obvious of these factors are the statutory tax rates—the rates that are written into the United States Code. Figure 5 shows the six statutory federal income tax rates, by filing status, that prevailed in 2005.[16] For each taxpayer, the amount of taxable income that falls within each of the tax brackets will be taxed at the rate for that bracket. For example, if a household in 2005 had taxable income of $39,805 and filed as "head of household," the first $10,450 would be taxed at the 10-percent rate, the next $29,350 (up to $39,800) would be taxed at a 15-percent rate, and the remaining $5 (the taxable income above $39,800) would be taxed at the 25-percent rate. In our example, the marginal tax rate is 25 percent. This means that, if a servicemember were to receive an extra $1 in an SRB, $0.25 of this would be paid in federal taxes.

Figure 5. Statutory federal income tax rates, by filing status, in 2005 (source: [2])

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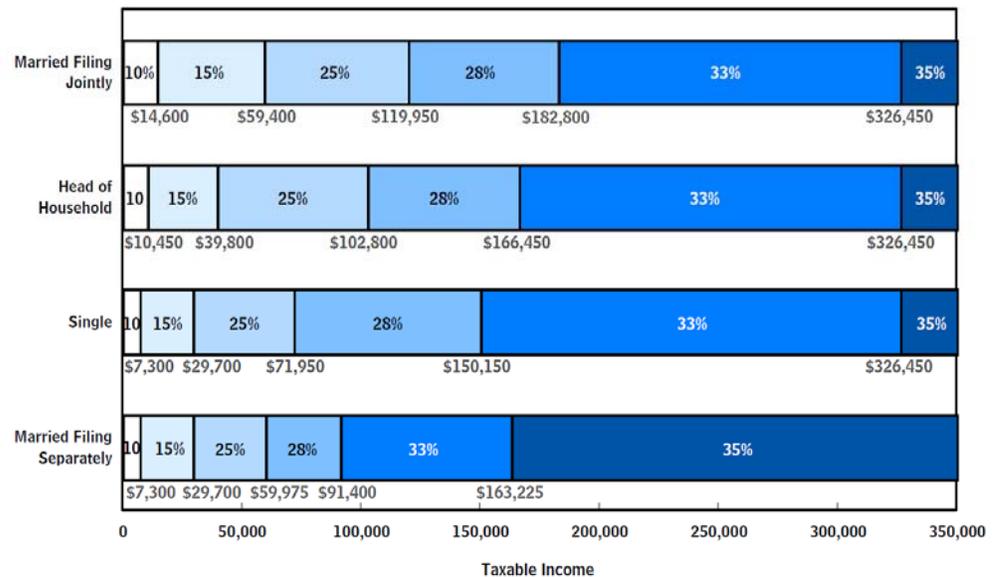
[16] Under the federal tax law for 2011, the six income tax rates have remained the same as in 2005 (at 10, 15, 25, 28, 33, and 35 percent). Over the last 6 years, however, there have been small changes in several of the income levels that define the tax brackets (the income levels at which the different tax rates take effect). These brackets have shifted slightly to the right. We discuss the tax rates for 2005 because they align with CBO's marginal tax rate analysis that we present in later in this study (figure 6). Using the 2005 data does not affect the overall conclusions of this report.

To derive a complete picture of how taxes affect the perceived value of an SRB, one must consider a large number of additional factors, such as:

- Taxpayers' characteristics, including income, itemized deductions, number of children, and filing status;

- Deductions and credits for which a taxpayer is eligible. Many of these affect the taxpayers' marginal tax rate and phase-in or phase-out over different levels of taxable income. Among these are taxation of social security, the alternative minimum tax credit, the earned income tax credit (EITC), limits on itemized deductions, and phase-outs of personal exemptions.

In its 2005 analysis [2], the CBO calculated how these factors would affect the marginal tax rates of different classes of taxpayers. In figure 6, we show the results of the CBO's analysis for a single filer who has no dependents, who derives all income from wages, and who itemizes deductions worth 18 percent of income (and who claims the greater of those deductions or the standard deduction). We focus on single filers because they are the most likely to experience an increase in the marginal tax burden as a result of a modest SRB payment. (Later, we present similar marginal tax rate figures for one who files as head of household.) Figure 6 suggests that, for a servicemember whose base salary is between $30,000 and $40,000, a modest SRB of $10,000 (approximately a level 1 SRB for a 4-year contract) could push the sailor from a 15-percent tax bracket to a 25-percent bracket.[17]

A worst case scenario concerning the effect of taxes

The data presented in figure 6 suggest that we can construct a worst case scenario to assess the effects of taxes on the savings that the service could realize from replacing APSRBs with LSSRBs. Consider the case in which a sailor has an annual base pay that we denote as ABP, and that, under an APSRB scheme, he or she receives an initial SRB payment that we denote as $APSRB_1$. The sailor also receives anniversary payments (denoted $APSRB_2$, $APSRB_3$, ...) over the life of the contract. In deriving this worst case scenario, we assume that all of the payments made under the APSRB scheme are taxed at the 15-percent rate. We denote the lump-sum SRB as LSSRB and assume

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[17] In 2011, an E-5 with more than 4 but less than 6 years' experience has a monthly base pay of $2,448 (which is equal to an annual pay of $29,376).

that *the entire amount of this payment that exceeds the initial payment under the APSRB scheme* is taxed at the 25-percent rate; that is, LSSRB – $APSRB_1$ is taxed at the 25-percent rate. Since the LSSRB will never be more than twice the value of $APSRB_1$, we know that the additional tax liability that results from transitioning from APSRB to LSSRB, $(0.25 – 0.15)*(LSSRB – APSRB_1)$ or $0.10*((LSSRB – APSRB_1)$, will always be less than

$$(0.10)*(2(APSRB_1) - APSRB_1) = (0.10)*(APSRB_1).$$

Figure 6. Effective marginal federal income tax rates on taxable income for a single filer in 2005 (source: [2])
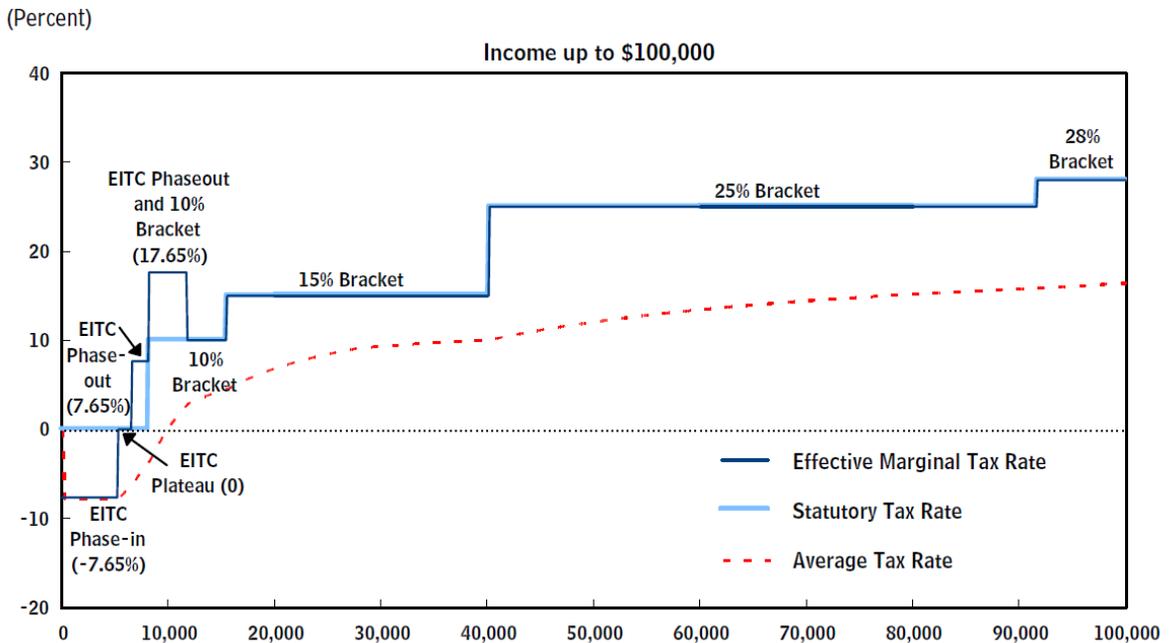
Table 5 shows the worst case scenario of how increased tax liability on LSSRBs could affect the savings that the service could derive from adopting a single LSSRB, in place of an APSRB, over an infinite horizon. At the discount rate that we think is most likely for our representative sailors (20 percent) and assuming the ½-percent additional rate of attrition, the worst effect that the increase in the sailor's marginal tax rate could have would be to reduce the Navy's IRR from 11 percent to 7 percent. (The IRR is lower because, in order to buy the same amount of retention, the Navy would, in effect, end up paying the sailor's tax liability on that portion of the LSSRB that pushes into the higher tax bracket.)

Table 5. A worst case scenario: IRR associated with replacing an APSRB with an LSSRB of equal perceived value when the lump-sum payment pushes sailors into a higher marginal tax rate

	With additional fraudulent departures - and with taxes				
Sailors' Discount Rate	0.005	0.01	0.02	0.05	0.10
0.05	-0.06	-0.06	-0.07	-0.09	-0.12
0.10	-0.02	-0.02	-0.03	-0.05	-0.08
0.15	0.03	0.02	0.01	-0.01	-0.05
0.20	0.07	0.06	0.05	0.03	-0.01
0.25	0.11	0.10	0.09	0.06	0.02
0.30	0.15	0.14	0.13	0.10	0.05
0.35	0.19	0.18	0.17	0.13	0.08
0.40	0.23	0.22	0.21	0.17	0.11
0.45	0.27	0.26	0.25	0.20	0.14
0.50	0.31	0.30	0.29	0.24	0.17

The rise in the average single sailor's tax bill resulting from the receipt of a modest lump sum bonus would likely be less than that suggested in our worst case example (it is unlikely that all the additional SRBs paid out in a single year under LSSRB would push into the next highest tax bracket). Moreover, for sailors who file their taxes under some other status, it is possible that receiving a modest lump-sum bonus (in place of an APSRB) would produce *no* increase in their tax bill. In figure 7, we present CBO data that show that receiving a lump-sum bonus would have very different tax implications for a sailor who files as a head of household with one child: note that the rise in the marginal tax rate from 15 to 25 percent occurs at a much higher level than for those using the single filing status. For these reasons, it seems reasonable that for modestly sized SRBs the Navy could ignore the tax implications of transitioning from APSRBs to LSSRBs.

For larger SRBs, however, it is an open question whether the service could fashion lump-sum payments that would be perceived as being of equal value to APSRBs. As we discuss in the next section, sailors are likely to apply smaller discount rates when considering the transfer of larger amounts of money across time. Moreover, larger SRBs may induce more abuse of SRBs than smaller amounts. If, for servicemembers offered $90,000 in APSRB, the appropriate discount rate were 10 percent and there were a 1-percent rise in the likelihood of fraudulent receipt of these SRBs, there would be a negative return of 2 percent associated with substituting LSSRBs for APSRBs (we are assuming that, at this level of SRB, servicemembers are aware of the tax implications of receiving an LSSRB

in place of an APSRB, and that the Navy must compensate sailors for the additional tax liability if they are to be retained in the service).

Figure 7. Effective marginal federal income tax rates for a head of household with one child in 2005

CTC = Child Tax Credit   Source: CBO (2005) [2]
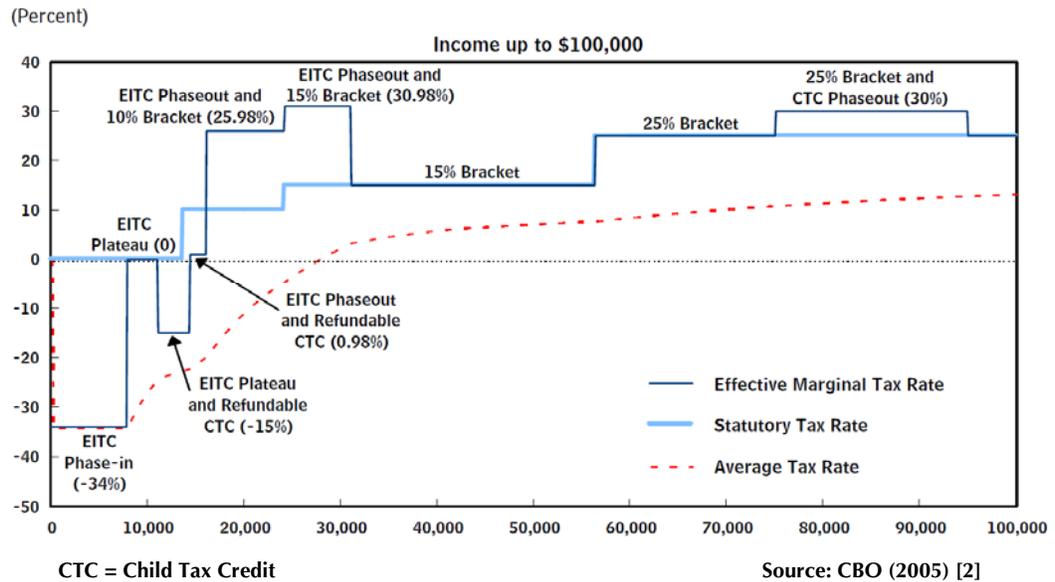
A recommendation

Because the characteristics of sailors and their families can have a large effect on the marginal tax rates of servicemembers, because the discount rates among sailors are highly variable, and because it is difficult (or impossible) for the service to discern these individual characteristics, the Navy should offer sailors a menu of choices for how they are paid reenlistment bonuses. These bonus choices could be constructed in such a way as to induce servicemembers to reveal information concerning their individual discount rates and tax situations, and the Navy could use this information to minimize its costs in achieving its retention goals.[18]

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[18] There is a substantial literature in Economics on how these types of menus can be constructed and on how the information gleaned from peoples' choices can be used to minimize costs (or, in the private sector, to maximize profits). These methods generally fall under the heading of "non-linear pricing" or "two-part tariffs." One well known example of this technique is health insurers offering customers a choice of policies with (1) a high deductible and low co-payment or (2) a low deductible and high co-payment. Less healthy customers will typically sort themselves into the first option and, knowing that those who choose this option will likely file more claims, insurers will set higher premiums for this group.

Such a menu might include the options shown below (these are ordered from those with the most delayed, or "back-loaded," payments to those with the most accelerated payments):

1) Bonuses that pay equal installments across all years of the reenlistment contract. This option would delay payment even more than under the current APSRB scheme: the first disbursement would be less than the initial 50 percent payment that is made at present, but all subsequent payments would be greater. This option could be attractive to those sailors who have relatively low discount rates and who wish to minimize their tax liability across their reenlistment term. The service would be able to price this option so that it would be less costly than providing the current APSRB.[19]

2) The current APSRB scheme. The Service may wish to retain, as one menu option, the current scheme of anniversary payment SRBs. Retaining this option would provide sailors with an obvious, fixed point of reference for the value of reenlistment bonuses over time (a point of reference that would have meaning regardless of any other changes in how SRBs are being disbursed).

3) A scheme in which the SRB is split between the earliest two tax years. One payment could be made at the time of reenlistment and a second on the first day of the next calendar year. This could enable sailors to reduce their tax liability by spreading the payment over two tax years, while making sailors wait the least possible time before receiving their money. (Again, such an option would be priced so as to yield savings relative to offering an APSRB).

4) The lump-sum SRB scheme.

Sailors would choose among these options based on the dollar payouts assigned to each scheme and the sailors' individual discount rates and tax situations. Over time, the Navy would be able to adjust the payouts for each of these schemes, induce different distributions of sailors among the various options, and then select that combination of payouts that achieves the desired level of retention at least cost. (While there can be significant

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[19] It would be less costly for 2 reasons: (i) since the payments are more "back-loaded" the Service would be able to earn a positive return on payments deferred to the future; and (ii) the sailors who choose this option would do so in order to lower their tax rate, and this option could be priced so that the Service could share some of this tax advantage.

administrative effort involved in creating these types of menus and experimenting to find the ideal set of payouts for each of the menu options, this sort of non-linear pricing may be able to substantially reduce the cost of retaining personnel.)

Possible increases in attrition with LSSRBs

In the previous parts of this analysis, we assumed that the overall level of attrition would be unaffected were the service to transition from APSRB to LSSRB. We did allow for the possibility that, at existing levels of attrition, those who leave the service would depart with more SRB monies (and we pointed out that it was unlikely that these monies would be recovered). Here, we consider the possibility that adopting LSSRBs could result in an increase in attrition during the term of enlistment for which the SRB was paid. We find that even small increases in such attrition could result in large increases in costs because the Navy would have to recruit and train additional sailors to offset the loss of personnel. However, we argue that there is likely to be only a very small rise in attrition as a result of adopting LSSRBs and that the Navy would be able to contain any such rise in attrition through careful control of the discharge status under which sailors exit the service.

The concern about increased attrition

It has been suggested that under an APSRB program, the prospect of receiving anniversary payments may be inducing a proportion of recipients to remain in the Navy rather than attriting during the term of service for which they have been paid an SRB. It is suggested that, in adopting LSSRBs and paying all of the SRB at the beginning of the term of reenlistment, this incentive would be eliminated and attrition could rise.

Were the introduction of LSSRBs to result in significantly greater attrition, the costs could be quite large. Reference [3] (Hansen et al., 2003) suggests that for each first-term reenlistment that the Navy fails to secure in its efforts to maintain a steady-state personnel inventory, the service must increase accessions by 1.4 recruits (this is an average across all ratings). For each of these accessions, the average recruiting cost was about $16,000 in 2002, and the average cost to train the recruit was about $27,000. Hansen et al. placed an additional value of about $45,000 per reenlistment

on the experience that a second-term sailor has above that of a new recruit. In total, the authors placed the cost of replacing a forgone reenlistment at about $123,000 (1.4 * ($16,000 + $27,000 + $45,000). We argue that it would be about half as costly to replace a single second-term attrite who departs the service because of a transition to LSSRBs; we suggest that the cost of replacing such an attrite would be about $60,000.[20]

A worst case estimate of the cost of attrition

To compare this cost with the net savings of adopting LSSRBs that we estimated in the previous sections, we must take the cost of replacing a single attrite and weigh this by the increase in the attrition rate that would result from the transition to LSSRBs. However, there is no reliable empirical evidence for how attrition changes with the introduction of LSSRBs. For this reason, we will construct an initial worst case estimate of how the introduction of LSSRBs might affect attrition; we will base this on existing estimates of how SRBs influence the decision to *reenlist*. We will than suggest what we consider to be a more likely estimate of how conversion to LSSRBs would affect attrition.

We construct this worst case estimate based on Hansen and Wenger [4], who studied Zone A sailors' decisions to reenlist in the Navy from FY87 to FY99.[21] They found that a one-multiple increase in bonus payments increased reenlistment rates by 2.5 percentage points.

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[20] The analysis by Hansen et al. [3] estimates the cost of replacing servicemembers who refuse reenlistment to a second term, and who depart the service just before the second term. In losing these sailors, the Navy would forgo their service for the *entire* second enlistment and all subsequent reenlistments. In contrast, the sailors who depart because of the absence of anniversary payments could leave the service *at any point* during the second term of enlistment; we assume that they leave at the mid-point of the second term. Moreover, because these sailors are close to being indifferent between military and civilian employment (it is assumed that the lack of a single anniversary payment could induce them to leave the service), these sailors are relatively unlikely to reenlist into third and subsequent terms of service. For these reasons, we place the cost of replacing the contributions of such sailors at about half that estimated in Hansen et al.

[21] Their sample included enlisted sailors making their first, nonobligated, long-term decision to reenlist and assumed a 20-percent discount rate. It excluded men who work in the nuclear field (because no comparable civilian earnings data were available for those who work in these occupations) and those who were not rated by the time of their first reenlistment decision (for these "GENDETs,," or general detail sailors, future civilian earnings streams were hard to predict).

To construct the worst case scenario, we consider sailors who have reenlisted to a 5-year contract and compare the circumstances they would face under an APSRB scheme and under an LSSRB scheme immediately after receiving the initial reenlistment bonus (of course, for the LSSRB scheme, the initial SRB payment is the *only* SRB payment). We will assume the following:

- The same number of personnel reenlist into a second term under the LSSRBs and APSRBs schemes (recall that the value of the LSSRB is set so that the median sailor is indifferent between the two types of bonuses).

- Once the Navy has paid out the lump-sum SRB at the beginning of the second term of service, the payment of this LSSRB has no further effect on a sailor's behavior (a sailor's decision about whether to attrite is based only on the prospect of future payments and not on whatever payments were made in the past).

- Sailors are able to attrite as easily as they can refuse reenlistment. More specifically, attrition doesn't threaten a sailor's ability to achieve a good conduct discharge.

- When sailors attrite during a term of enlistment for which they received an SRB, they are not effectively required to repay any of the SRB monies that they received for reenlistment into that term of service.

To calculate the worst case for how attrition could affect the net savings (net costs) of transitioning to LSSRB, we start with the estimate that we derived earlier (when we assumed that there would be no additional attrition resulting from a transition to lump-sum bonuses): we argued that the service would experience about $96 of savings for every $1,000 of APSRB that it converted to LSSRB (assuming that sailors have an average discount rate of about 20 percent). In other words, if the Navy were to convert $10,000 of APSRBs to LSSRBs (which is a little less than a one-multiple increase in SRB for an E-5 reenlisting to a 5-year contract), it would experience net present value savings of $960.

We then consider the situation that a representative sailor would face the day after the initial payment had been made under APSRB and compare this with what he or she would face under LSSRB. Under APSRB, the

sailor would look forward to receiving an additional $5,000 in anniversary payments over the following 4 years: this is a little less than half the value of a one-multiple increase SRB. Under the LSSRB, however, the sailor would look forward to no further SRB payments during the current term of reenlistment. We can then take the cost of replacing a single attrite (which we earlier estimated at $60,000 in the current context) and weigh this by the increase in the attrition rate that would result from a one-half multiple decrease in SRB (which we take as one-half of the 2.5-percent estimate of Hansen et al. [3]). This yields a worst case cost of attrition of $750 ($60,000 * 0.5 * 0.025).[22]

The bottom line for this worst case scenario

Even assuming a worst case scenario for attrition resulting from a transition to LSSRB, we see that replacing a $10,000 APSRB with an LSSRB of equal value to the representative sailor would result in a net savings to the Navy of $210 ($960 - $750). This extreme example points up that a transition to LSSRBs would entail little risk of significant monetary loss to the service.

A more likely attrition scenario

There are several reasons why, if the Navy were to transition to LSSRBs, we should expect to see much less attrition among sailors than is suggested under our worst case scenario:

- Perhaps the most important reason is that the process of attriting from the service can be much more complicated and costly than refusing reenlistment. Unless servicemembers attrite with hardship discharges, or for some approved reasons, they would leave the Navy with less then honorable discharges. Having this classification on one's discharge can have detrimental effects in securing employment in the civilian world, and the great majority of sailors would be highly reticent to attrite under these conditions.

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[22] To simplify this discussion, we have ignored the sailor's discount rate and the government's cost of funds in this particular set of calculations. Had we integrated these factors into our predictions, our estimates of the net savings of transitioning to LSSRBs would have been slightly greater.

- Many sailors (perhaps the great majority) would feel honor-bound to complete a term of service to which they have contracted, and for which they have received an SRB.

- While sailors are in the processes of deciding whether to reenlist, they may spend significant time exploring the opportunities that are available in civilian employment. However, once they have made their reenlistment decision, servicemembers are likely to be much less focused on the civilian job market and, as a result, less likely to find opportunities that would impel them to leave the service.

In the worst case scenario discussed earlier, we estimated that there would be a 1.25-percent rise in attrition associated with converting a 1-multiplier APSRB to an LSSRB. We expect that the actual level of attrition would be substantially less than this. In table 6, we calculate the IRR for converting from APSRB to LSSRB, conditional on a rise in attrition of between 0.05 percent and 0.5 percent. (Below that we present our worst case scenario which is highlighted in gray.)

Table 6. The IRR given additional attrition from the services[a]

Attrition -- percentage increase resulting from changing $10K APSRB to LSSRB	The discount rate of the representative sailor					
	0.10	0.15	0.20	0.25	0.30	0.35
0.05 percent	1.80	6.21	10.60	14.97	19.32	23.65
0.10 percent	1.51	5.89	10.26	14.61	18.94	23.25
0.20 percent	0.91	5.26	9.59	13.89	18.18	22.45
0.50 percent	-0.90	3.33	7.54	11.73	15.89	20.03
1.25 percent	-5.57	-1.64	2.26	6.14	9.98	13.80

a. The highlighted figures are the worst case (and highly unlikely) scenario developed in the body of the text.

The Navy has some control over the rise in attrition

Note that the increase in attrition that would be observed with a transition to LSSRBs would be, to a substantial degree, under the control of the Navy. Sailors' willingness to attrite from the service depends to a large extent on whether they can arrange departure with an honorable discharge. In general, securing an honorable discharge comes down to sailors convincing the Navy that, for reasons outside their control, they can no longer remain in the service. An important element in controlling the

number of attrites is the amount of due diligence that the Navy exercises in assessing why sailors are seeking a discharge. It's within the service's power to increase or decrease attrition by being less or more stringent in granting honorable discharges.

A recommendation

If the Navy introduces lump-sum SRBs, it should closely monitor departures from the service among those who have been paid SRBs in order to ensure that this change in policy does not result in an increase in losses (and produce an associated rise in personnel costs). The proportion of personnel who depart the service with honorable discharges during any term of reenlistment should show little deviation over time; the conditions that would permit servicemembers to attrite under honorable conditions (such as family hardship) should not change with the business cycle, the service's OPTEMPO, or how the service chooses to pay out enlistment bonuses. If it is found that the introduction of lump-sum SRBs is associated with a rise in honorable discharges, the service should examine the processes with which it evaluates requests for this type of discharge.

Conclusions and recommendations

The net monetary benefit: An initiative with a high rate of return and low risk

At the beginning of this analysis, we suggested that, to assess the desirability of replacing APSRBs with LSSRBs, we would have to weigh the *savings* that could result from being able to offer sailors less costly bonuses against *losses* that could result from an increased incidence of personnel taking SRBs but then failing to complete their obligated terms of service. A key finding of this study is that, under most likely circumstances, the savings from adopting LSSRBs would greatly outweigh the losses. We expect that, under the most likely conditions, the Navy would save approximately $100 for every $1,000 of APSRB that it replaces with an LSSRB.

These savings, however, could only be realized if the Navy were willing to bear increased SRB costs in the first POM in which the service transitions from APSRBs to LSSRBs. In the case of SRBs for reenlistment to 5-year contracts, the service would have to bear a cost of $506 per $1,000 of APSRB in the first POM to realize savings of $570 in each subsequent POM. In the case of 6-year reenlistment contracts, the Navy would have to bear somewhat greater costs per $1,000 of APSRB, but the subsequent savings would be greater. We find that, in bearing these additional costs during the first POM, the service would most likely earn an IRR of about 10 to 11 percent.

We also find that the savings associated with this policy change would come at relatively low monetary risk. The IRR for adopting LSSRBs is positive (implying a net benefit for the government) for almost any reasonable value that we might assign to the discount rate of the median servicemember, and for virtually any reasonable rise in losses that might result from greater abuse of SRBs.

Possible arguments against adoption

Despite the attractive monetary aspects of adopting LSSRBs, there are two issues that could argue against the policy. The first is the nonmonetary issues that we discuss in appendix B. Were it to introduce LSSRBs, the service would sacrifice some of the flexibility it has in managing its reenlistment bonus program during economic expansions, but it might find it significantly easier to execute the program during economic downturns. We are not in a position to assess which circumstance—economic expansions or economic contractions—offers the greater challenges to SRB administrators and, for this reason, we do not offer guidance on this issue.

The second potential argument against the introduction of LSSRBs is the current economic and political environment in which lawmakers are anxious to effect near-term budget cuts. In such circumstances, it is possible that short-term funding might not be provided even to initiatives that could demonstrate strong potential for generating substantial long-term savings. For this reason, we have considered how the service might introduce LSSRBs in a way that minimizes initial costs. We discuss these methods in the last sections of this analysis.

As we have discussed at some length, were the Navy to introduce LSSRBs, those who manage the service's reenlistment bonus program would need to argue for additional funding in the early years of the transition in order to support the LSSRB's greater up-front costs. When the Marine Corps and the Army substituted LSSRBs for APSRBs (in 2001 and 2005, respectively), we observed very large increases in the SRB budgets for these services (although, in the case of the Army, the introduction of LSSRBs coincided with large rises in both the number of servicemembers awarded reenlistment bonuses and the amount of bonuses they were offered).

Moving to LSSRBs for only some enlisted communities

Among the methods that could be used to limit the up-front costs of introducing LSSRBs, perhaps the most effective would be to initially offer LSSRBs to only a portion of the population that is eligible for bonuses (continuing to pay APSRBs to the remainder of SRB recipients). The service could introduce LSSRBs in only those cases with the lowest up-front costs and greatest long-term savings. These would include the following:

- *Cases in which relatively small SRBs are to be offered.* We have argued that sailors are likely to apply a higher discount rate when they are considering shifting smaller amounts across time. When sailors apply higher discount rates, the service can offer smaller LSSRBs in place of APSRBs. Moreover, when smaller sums are involved, there is less likelihood that offering LSSRBs in place of APSRBs would push sailors into higher marginal tax brackets (and again, when sailors remain in lower marginal tax brackets, the Navy is able to offer smaller LSSRBs).

- *Cases that involve shorter reenlistment contacts.* For any given discount rate on the part of our median sailor and any given dollar amount of APSRB, the service would need to offer a smaller LSSRB when shorter reenlistment periods are involved (e.g., reenlistments for 4 years rather than 6 years). This effect may be partially offset because people's discount rates tend to decrease with the length of time over which they are considering transferring money (it is unclear, however, whether there is a significant difference in the discount rates over a 4- or 6-year horizon).

- *Cases in which sailors are likely to have higher discount rates.* The economics literature suggests that discount rates are negatively correlated with people's age and education. Younger servicemembers and sailors who have had less rigorous training are likely to have higher discount rates, and it is likely that they can be retained in the service with smaller LSSRBs.

There are also instances in which the service would likely wish to refrain from *ever* substituting LSSRBs for APSRBs. One obvious case would be SRBs for those in nuclear ratings. These recipients are generally older and better educated than the average servicemember, and they are often reenlisting for 6-year contracts—all of which implies that the sailors would have lower discount rates and that the service would generate smaller savings from transitioning to LSSRBs. Moreover, bonuses for those in the nuclear community are often quite large (they have been up to $90,000), and it is likely that many of these recipients would wish to receive their bonuses across multiple years to reduce their tax liabilities.

Finding the best time to phase in LSSRBs

There may be some circumstances—perhaps some phases of the business cycle—in which the Navy would find it easier to fund the transition to LSSRBs. Over the last 10 years, both the Marine Corps and the Army have substituted LSSRBs for APSRBs, and both services made this change when they had relatively rich budgets for reenlistment bonuses. For example, before the Marine Corps transitioned to LSSRBs in 2001, the service's FY00 budget request for SRBs was $20 million, and its actual expenditures for that year were only modestly above this level ($25 million). As it transitioned to LSSRBs during FY01, however, actual expenditures rose to $47 million, more than twice the budget request for that year. In 2002, the GAO suggested that much of this increase in the Marine Corps SRB budget was the result of the service shifting to lump-sum payment of SRBs [5].

Not only was SRB funding sharply increased when the Marines transitioned to LSSRBs, the need for bonuses was weakening. When the Marines introduced the LSSRB in 2001, it was at a time of increasing unemployment. Just a few months earlier (at the end of CY00), the unemployment rate had stood at an unusually low 3.9 percent, and all the services were offering substantial bonuses to sustain reenlistment. Eight months later (in August 2001), however, unemployment had risen to 5.0 percent and, after another 4 months (ending in December 2001), the rate had risen to 5.7 percent. Since the unemployment rate was rising rapidly in 2001, the need for SRBs was declining and at least some of the Marine Corps' existing SRB funding could be redirected to financing the introduction of LSSRBs.[23]

The Army also experienced a large increase in its budget when it introduced lump-sum SRBs in 2005, but this was at a time when both the number of new SRBs and the values of SRBs were greatly expanding. As a result of the difficult conditions that prevailed in Afghanistan and Iraq at that time, the Army was facing significant challenges in sustaining retention, and Congress was willing to fund large increases in SRB funding: the total SRB outlay between 2004 and 2005 increased from $143 million to $506 million. See [7] (Asch et al., 2010). (It is not possible to determine how much of this increase in funding was needed for the Army to adopt LSSRBs in place of APSRBs.)

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[23] Reference [6] (Hattiangadi et al., 2004) shows that the military/civilian pay index began a sharp increase in 2001 (p. 43), which enabled the Marines to reduce the SRB levels in many occupation codes (PMOSs).

Why this might be the best time to transition to LSSRBs

Despite the fact that the Marine Corps and the Army transitioned to LSSRBs during a period in which SRB funds were in relative abundance, there are several reasons why the best time to introduce LSSRBs may be when the economy is in the midst of a recession, as is currently the case. In the paragraphs that follow, we present two reasons.

This is a time when the SRB budget is small and much of the budget consists of existing obligations; there are few new commitments being made relative to existing obligations (figure 8 shows the marked decline in SRB commitments over the last few years). Moreover, the average SRB is now relatively large: SRBs are being issued to only a small number of communities, but these tend to be the more technical occupations that are offered larger bonuses (e.g., those in the nuclear community with NECs 3356/66 are still being offered an SRB multiple of 9.5 for a reenlistment to a 6-year contract). All of this implies that there are relatively few of the smaller SRBs for which the LSSRB would be most appropriate, and transitioning these bonuses to LSSRB would entail a relatively small percentage increase in the SRB budget. Starting the transition to LSSRBs with only a small number of bonuses would permit the service to experiment with finding the optlevels for these bonuses (levels that minimize the cost of attaining the service's retention goals).

Figure 8. The percentage of reenlisting zone A sailors receiving SRBs
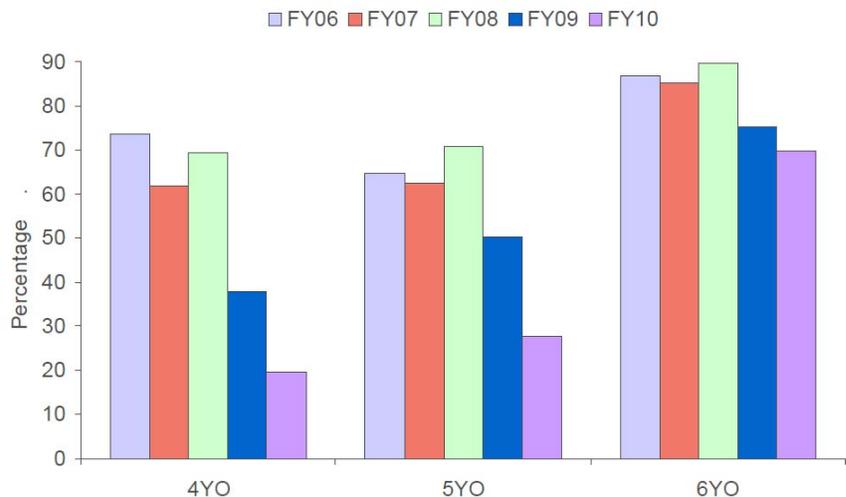
Source: Goltin, 2011 [8].

Moreover, if, as it appears, the economy will be slow to recover, the service will be able to adapt to an LSSRB program in a relatively stable economic environment. The service could undertake its experiment in setting the values for LSSRBs without having to cope with rapid changes in military/civilian pay ratios.

Recommendations

Based on our analysis, we recommend the following:

- Implement a program in which at least some of the APSRBs being issued could be converted to LSSRBs. Developing such a program is likely to have a large return on investment (our best estimate is an 11-percent IRR).

- Begin the program on a pilot basis, offering LSSRBs first to servicemembers who are reenlisting for relatively small bonuses, or to shorter terms of reenlistment. These sailors are likely to have discount rates that are higher than average, and converting their bonuses to LSSRBs is likely to have a higher than average rate of return.

- Monitor the results from this pilot program and ensure that, in converting to LSSRBs, there is not a change in the composition of those who reenlist. The changes to monitor include age, family composition (which would imply the family's tax filing status), race, ASVAB score, and promotion timing.

- Introduce the LSSRB program as a menu of options from which the servicemember could choose. These options should be more comprehensive than just a binary choice between LSSRB and APSRB and should be designed so that the service can meet its retention goals at least cost.

- As part of the pilot program, the Navy should develop educational materials that would help servicemembers understand the tax implications of choosing LSSRBs over APSRBs (or choosing one of the other options they are offered).

- The results of the pilot program should be carefully assessed so that the details of the bonus options could be reworked, if needed, to ensure that the program is producing the best possible results.

- If, as expected, the pilot program proves to be successful—if it is easy to administer and meets the service's retention goals at a significantly reduced cost—the service should expand the options to choose from the LSSRB menu to all sailors who are eligible for SRBs.

- Maintain long-term monitoring of the program.

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Appendix A: The discount rate of sailors

Implicit in all the diagrams we present in the body of this paper is one essential fact: the net savings that could be gained from transitioning to LSSRBs are very sensitive to the discount rates of servicemembers. This, then, raises two critical questions: (1) what are the likely values of sailors' discount rates, and (2) how are discount rates likely to vary among cohorts of sailors?

The discount rate of the median sailor

There is a substantial empirical literature in which the discount rates of different populations have been calculated, but only a small number of studies have made estimates for those who serve in the military. Among these is a 1982 analysis by Cylke et al. [9] in which the authors used data on SRBs paid out between 1978 and 1980 to estimate a discount rate of 17 percent for enlisted personnel. In 1984, Black examined data from a survey of servicemembers' preferences for retirement benefits and estimated discount rates for enlisted personnel of 12.5 percent [10]. More recently, Warner and Pleeter (2001) used data on separation packages issued between 1992 and 1995 and estimated much higher real discount rates for enlisted personnel—between 30 and 40 percent [11].

Given the large range of findings reported in these studies, one might infer that there is little room for consensus regarding servicemembers' discount rates. When one looks more carefully at the findings and considers the stylized facts that have been noted in other analyses of discount rates, however, patterns emerge from the data that suggest that the most reliable estimates for use in an SRB analysis are those inferred by Cylke et al. [9]. For example, it is likely that the estimates by Black [10] *understate* servicemembers' discount rates for SRBs because they are based on decisions involving much larger sums of money and much longer payout intervals than SRBs. Among the stylized facts regarding people's time preferences for money is that the discount rate declines with both the sums

involved and the time period over which trade-offs are made (see Thaler, 1981 [12]).[24]

Similarly, there is reason to believe that the results in Warner and Pleeter [11] overstate the discount rate. This analysis is predicated on a choice of separation packages with which servicemembers were presented (one lump sum and one annuity), and the findings are based on the assumption that all the characteristics of the separation packages were of equal value with the exception of the patterns of payments. As the authors point out, however, for the first year of the four years in which sailors were offered the choice of separation packages, the lump-sum option enjoyed several nonmonetary benefits that the annuity option did not (these included the length of obligated reserve-component service, continuation of medical coverage, and the time servicemembers would have before needing to depart military housing). While these advantages were done away with in the second year of the program and the study examined only the period after the advantages were eliminated, it is possible that conventional wisdom among sailors concerning the relative desirability of the programs had congealed during the initial year and influenced servicemembers' decisions through the end of the program.

Moreover, there is also the possibility that the strong preference for lump-sum payments seen in Warner and Pleeter reflects not only high discount rates among servicemembers but also an insurance benefit implicit in the receipt of lump-sum payments. Those who were choosing between the two separation packages would soon depart the services, and a significant proportion would face the prospect of an indeterminate period of unemployment before securing work in the private sector. Many would face this prospect with few assets of their own and, given that they would be unemployed, would find it difficult to gain credit based on future earnings. On one hand, an E-5 with 9 years of service who chose the lump-sum package would leave the military with $22,283 with which to weather a period of unemployment. On the other hand, were the servicemember to choose the annuity, he or she would receive only $3,714 as an initial payment. It is possible that, if the servicemembers were not facing a period of unemployment or were not credit constrained, many more would have

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[24] Another reason to put less weight on the Black analysis [10] is that it is based on data taken from survey questions; this type of analysis is often at odds with, and proves less reliable than, estimates based on observed behavior.

chosen the annuity option, and Warner and Pleeter [11] would have inferred lower discount rates. (Note that this insurance issue was not a factor in the analysis by Cylke et al. [9] because the population examined in that work was being reenlisted rather than being separated from the service.)

There is another intuitive test—a thought exercise—that one can employ to assess the likely discount rate that servicemembers apply to decisions about SRBs. The great majority of service personnel have access to substantial amounts of credit card debt, and this type of financing usually carries an annual interest rate of 18 to 21 percent. If our median servicemember had a discount rate above 21 percent, he or she would be willing to pay more than 21 percent interest in order to transfer consumption from the future to the present. In such a case, the servicemember would secure as many credit cards as possible and would carry the maximum balance on these lines of credit (he or she would be making only the minimum necessary payments). If, however, our median servicemember had a discount rate of less than 18 percent, he or she would be unwilling to transfer consumption from the future to the present at such a high cost and would seldom carry positive credit card balances. Finally, if the median serviceperson's discount rate were in the range of 18 to 21 percent, he or she would generally carry balances on these credit lines but would *not* be perpetually "max'ed out" on credit cards. While we have only sketchy data with which to validate this assertion, we think it likely that the majority of servicemembers who are eligible for SRBs would be carrying credit card balances from month to month but would not be perpetually employing their full credit card line.[25] If this is in fact the case, it would imply that our representative sailor has a discount rate in the range of 18 to 21 percent.

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[25] In March 2011, Experian, an international credit information company, reported on credit use in U.S. metropolitan areas. Four of the 10 areas with the greatest credit card use had high concentrations of military personnel. Hampton Roads, VA, for example, ranked 6th in the nation with $4,925 credit card debt for the average household, compared with a national average of $4,284. Nevertheless, even in such high-debt areas as Hampton Roads, the average credit card user had used only 37 percent of the credit available in his or her accounts (nationally, this figure stood at 30 percent). See Shean (2011) [13].

How discount rates change among cohorts and across circumstances

The economics literature has yielded a variety of stylized facts about how discount rates vary by individuals' personal characteristics and the particular circumstances in which the discount rate calculations are undertaken. These stylized facts are relevant to our discussions about how the Navy might introduce LSSRBs in a way that (a) limits the policy's monetary costs across the POM and (b) minimizes possible adverse nonmonetary consequences of the policy.

The literature consistently suggests that discount rates are negatively correlated with

- the amount of time that one must wait for reward or penalty (people's discount rates decline when they consider transferring money across longer periods of time); and

- the amount of money that is being transferred across time (people apply larger discount rates when considering smaller sums of money).

Discount rates are also found to vary with the following personal characteristics:

- They are lower for those who are older, have greater income, and are more educated.

- They increase with the number of dependents in a household.

Finally, there is no consistent relationship found between personal discount rates and either gender or marital status. (An excellent discussion of these stylized facts can be found in Frederick, Lowenstein, and O'Donoghue (2002) [14].)

Appendix B: Nonmonetary issues concerning LSSRBs

Administering APSRBs during economic contraction

In addition to saving money over the long term, another justification that one frequently hears for adopting lump-sum payment of SRBs is that such a program would be easier to administer. The argument is based on the fact that, when a service pays SRBs in anniversary installments, it usually begins a fiscal year with some "overhang" of obligations from the past—obligations to make anniversary payments that were promised in previous years. As a result, in any given fiscal year, only a portion of the SRB budget is discretionary and any decrease in SRB funding must come out of this discretionary portion of the budget. Those in the services who administer reenlistment bonuses indicate that those who set the budgets for SRBs seem unaware of this issue and that, as a consequence, the budget for SRBs can be subject to excessive tightening—particularly when the economy is starting to contract after an expansion.

We illustrate this point in the next two tables. Table 7 shows a notional case of how a service's SRB overhang, as a proportion of the total SRB budget, can change over a hypothetical business cycle that lasts 14 years:

When SRBs are paid in installments, seemingly small reductions in overall SRB funding can have big effects on a service's ability to offer new bonuses

- In the first year of our example, shown in column 1, we assume that the economy has been at the nadir of a recession for a few years and the Navy has been able to maintain desired retention without offering SRBs. In year 2, however, the economy begins to expand and the service must offer a bonus to retain its members: to keep our math simple, we assume that it offers a single APSRB of $800, half of which is paid in the first year (year 2), with the remainder paid in four equal annual installments. At this point, the service has no previous commitments for anniversary payments, and the overhang, as a proportion of the total SRB budget, is 0.

- Over the next few years, the economy continues to expand and the service must increase its SRB to maintain the desired level of retention. By the 6th year, the economy has reached the apex of the

business cycle, and the overhang has grown to $650 ($100 + $125 + $175 + $250) and constitutes 0.39 of the total SRB budget ($650 / ($1,000 + 650)).

- Over the following few years, our example shows the economy experiencing a prolonged period of healthy performance in which the service has been able to sustain retention by offering constant levels of SRBs ($1,000 per year). By year 9, SRBs have been stable for 5 consecutive years, and the overhang is exactly half of the SRB budget.

- Finally, we see that, as the economy begins to contract in year 10 and the need for SRBs declines, new commitments will fall relative to the obligations contracted in the previous years, and the overhang will rise above 50 percent of the SRB budget.

Table 7. A notional case showing how the proportion of overhang to total SRB budget can change over the business cycle

Year in the business cycle

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Economic Expansion				Top of the Business Cycle					Economic Slowdown				
Time	0													
	0	400												
	0	100	500											
	0	100	125	700										
	0	100	125	175	1000									
	100	125	175	250	1000									
		125	175	250	250	1000								
			175	250	250	250	1000							
				250	250	250	250	1000						
					250	250	250	250	700					
						250	250	250	175	500				
							250	250	175	125	400			
								250	175	125	100	217		
									175	125	100	54	100	
											125	100	54	25
												100	54	25
													54	25
														25
Overhang as a proportion of SRB budget		0.00	0.17	0.24	0.29	0.39	0.44	0.48	0.50	0.59	0.65	0.67	0.75	0.82

When previous commitments to make anniversary payments constitute a large fraction of the SRB budget, this can leave a service in a budgetary bind because any reduction in overall funding would have a much amplified effect

on the number of new bonuses that could be offered. For example, consider a situation in which a service's total budget for SRBs was $100 million, and 66 percent of this ($66 million) had been previously committed to anniversary payments. This would leave 34 percent—or $34 million—available for new SRB commitments. In such circumstances, a 25-percent reduction in the overall budget ($25 million) would necessitate an approximately 75-percent reduction in the service's ability to undertake new SRB commitments. The SRB administrators with whom we spoke indicated that their funding sources generally do not appreciate that the APSRB scheme amplifies SRB budget reductions in this way.

More generally, table 8 shows how a percentage change in the *overall* SRB budget would affect the service's budget for *new* SRBs, given the proportion of the SRB budget that must be spent on previously obligated anniversary payments. The table point out that, if the overhang in the Navy's SRB budget is 0.5 (50 percent), a 10-percent reduction in the total SRB budget would result in a 20-percent decline in the service's ability to contract new SRBs.

Table 8. How a percentage fall in the overall SRB budget affects the service's ability to issue new SRBs, given the proportion of the SRB budget previously obligated

	Reduction in budget			
	0.10	0.25	0.33	0.50
0.10	0.11	0.28	0.37	0.56
0.25	0.13	0.33	0.44	0.67
0.33	0.15	0.38	0.50	0.76
0.50	0.20	0.50	0.66	1.00
0.66	0.30	0.75	1.00	
0.75	0.40	1.00		
0.90	1.00			

Overhang as a a proportion of the total SRB budget

Administering APSRBs when the economy is expanding

Although an APSRB scheme can impose significant added administrative difficulties on the service during times of economic contraction, this scheme can also provide the service with *increased* administrative flexibility during times of economic expansion. When the economy is heating up and it is necessary to expand SRBs to maintain retention, the services often find that their SRB budgets are inadequate to meet these growing needs and that there is significant lag in obtaining increased funding. Paying SRBs in anniversary

installments—rather than in lump sums—allows the service to offer bonuses to more personnel and, in so doing, to retain more personnel.

The need for flexibility in administering SRBs arises from inherent rigidities in the way SRB budgets are determined across the POM. Funding for reenlistment bonuses is generally set as a function of expected future economic activity: future SRBs are funded at a high level if the economy is expected to experience low unemployment and are funded at a low level if a recession is anticipated. However, it is notoriously difficult to accurately predict the level of future economic activity over an interval as long as the POM, and budget planners often set SRB budgets by assuming that future conditions—and future needs for SRBs—will closely resemble those that prevail when the budget is constructed.[26] While, in theory, appropriations can always be increased to meet unforeseen economic expansion, it is often difficult in practice to adjust appropriations in the short run. As a result, when an economic expansion begins, the services may find that they must overspend their SRB budgets to meet retention goals. This phenomenon was observed by the GAO [5] immediately after the dot-com boom:

> from fiscal year 1998 through fiscal 2001, none of the services' Selective Reenlistment Bonus Programs stayed within their appropriated program budgets. Rather, with the exception of the Marine Corps, the services reprogrammed or realigned funds from other programs within the enlisted personnel budget to make more bonus payments than they were originally funded to pay. The services are able to do this under their budget authority....During fiscal years 1997 -- 2001, the Navy exceeded its appropriated budget by more than $121 million; the Air Force, by $70 million and the Army, by about $49 million.

When the services find that the economy is heating up more than expected and that SRB funding is lagging SRB needs, it can be appropriate to overspend current appropriations and grow SRB programs in anticipation of receiving greater funding in subsequent years. For any given amount of overspending in a year (spending above appropriations) an APSRB scheme will enable a service to gain significantly greater retention than an LSSRB scheme. For example, a service might overspend by $1,000 in a fiscal year by either issuing one $1,000 LSSRB or by initiating two APSRBs of $1,000 (making initial payments of $500 on each of two APSRBs). This latter tack would only be desirable, of course, if a service were assured of receiving sufficient funding in subsequent years to cover the additional anniversary

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[26] Extrapolating from current conditions in this way can be a highly defensible approach to macroeconomic forecasting. See Denrell and Fang [15] and Tetlock and Mellers [16].

payments that will come due. If the service were confident that its SRB funding would grow in the future, an APSRB scheme could enable a service to weather temporary rigidities in the funding of its SRB budget.

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