APPENDIXES

APPENDIX A

ESTIMATION OF MORTGAGE INTEREST PAYMENTS AND REAL ESTATE TAXES FOR MILITARY HOMEOWNERS

The combined mortgage interest payments and real estate taxes of military homeowners constitute a necessary component of this analysis. Because the figure for housing costs that is reported by military homeowners (through the Variable Housing Allowance (VHA) Survey) also includes principal and insurance payments, an adjustment is required to focus on mortgage interest payments and real estate taxes. CBO accomplished this modification as follows: 1/

$$\text{IT (Military)} = \frac{\text{IT (US)}}{\text{PITI (US)}} \times \text{PITI (Military)}$$

where:

IT (Military) = Estimated mortgage interest payments and real estate taxes for military homeowners by pay grade and location in the continental United States.

PITI (Military) = The reported payments on the principal, mortgage interest, real estate taxes, and homeowner's insurance by pay grade and location in the continental United States.

IT (US) = Typical mortgage interest payments and real estate taxes in the United States as of 1984, based on average characteristics of mortgages outstanding and property taxes. In particular, the mortgage is assumed to be in the fourth year of a 27-year term with an interest

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1. Besides the data from the VHA survey, additional information used in this estimating procedure was derived from three sources: *Federal Home Loan Bank Board Journal*, vol. 17 (April 1984); The National Association of Home Builders, *Economic News Notes*, vol. 29 (February 1985); and Department of Commerce, Bureau of the Census, and Department of Housing and Urban Development, Office of Policy Development and Research, Annual Housing Survey: 1983 (December 1984). Moreover, the resulting estimates for IT (Military) implicitly assume that the real estate tax burden for military homeowners is the same as that for the general population.

rate of 11 percent. The property tax rate is assumed to be 1.2 percent and the mortgage represents 75 percent of the house value when new. House value was updated with the Consumer Price Index (CPI).

PITI (US) = Typical payments on the principal, mortgage interest, real estate taxes, and homeowner's insurance in the United States using the same assumptions as for IT (US). Insurance rates are set at 0.3 percent of house value.

APPENDIX B

ESTIMATED CHANGES IN TAXES FOR MILITARY HOMEOWNERS

The computation of the estimated change in the federal income tax liability of military homeowners under the Military Homeowners Tax Plan (MHTP) is as follows: 1/

$$\Delta T = T_{86}[MP\text{-}PE\text{-}(\hat{TD}\text{-}ZB)] - T_{86}[MP\text{-}PE\text{-}(\hat{OD} + (\hat{IT}\text{-}\tilde{HA})\text{-}ZB)]$$

$$\text{if } \hat{IT} > \tilde{HA}$$

or

$$\Delta T = T_{86}[MP\text{-}PE\text{-}(\hat{TD}\text{-}ZB)] - T_{86}[MP\text{-}PE\text{-}(\hat{OD}\text{-}ZB)]$$

$$\text{if } \hat{IT} \leq \tilde{HA}$$

where:

ΔT = Change in federal income taxes

T_{86} = 1986 tax schedule

MP = Basic pay plus taxable special pays and allowances

PE = Personal exemptions for estimated family size

$\hat{TD}$ = Estimated total deduction $\left(= \frac{\hat{IT}}{.75}\right)$

ZB = Zero bracket amount for filing status

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1. For illustrative purposes in the following specifications, homeowners are assumed to itemize their deductions, which may not always be the case. In the event that they do not itemize deductions, the terms inside each outer bracket--taxable incomes--are computed as though the amounts within the inner parentheses are zero.

$\hat{OD}$ = Estimated other deductions ($=\hat{TD}-\hat{IT}$)

$\hat{IT}$ = Estimated mortgage interest payments and real estate taxes

$\tilde{HA}$ = Combined tax-free allowances of Basic Allowance for Quarters and Variable Housing Allowance.

APPENDIX C

DESCRIPTION OF ACOL MODEL AND ITS APPLICATION IN THIS STUDY

This appendix describes the method used to estimate career force losses resulting from the elimination of the double tax benefits for military homeowners. Because the probabilities of future homeownership for service members are not known, it would be difficult to provide a point estimate of the expected future loss in tax benefits, both to current homeowners and to those who do not now own homes. Consequently, the Annualized Cost of Leaving (ACOL) model of the Department of Defense (DoD) was used to provide upper and lower bounds. The lower bound is based on "myopic behavior"; the upper bound is not. Specifically, the low estimate assumes perfect myopia by both owners and nonowners--that is, both groups are assumed to act as if their current ownership status will be permanent. This is represented algebraically as:

$$p(H_1 \mid H_0) = 1, p(N_1 \mid N_0) = 1, \text{and}$$

$$p(N_1 \mid H_0) = 0 = p(H_1 \mid N_0),$$

where H and N are homeowners and nonowners and the subscripts are time periods.

The high estimate assumes perfect foresightedness--that is both groups are assumed to behave as if they have equal probabilities of homeownership in the future, regardless of their present status. Thus,

$$p(H_1 \mid H_0) = p(H_1 \mid N_0) = p(H_1) \text{ and}$$

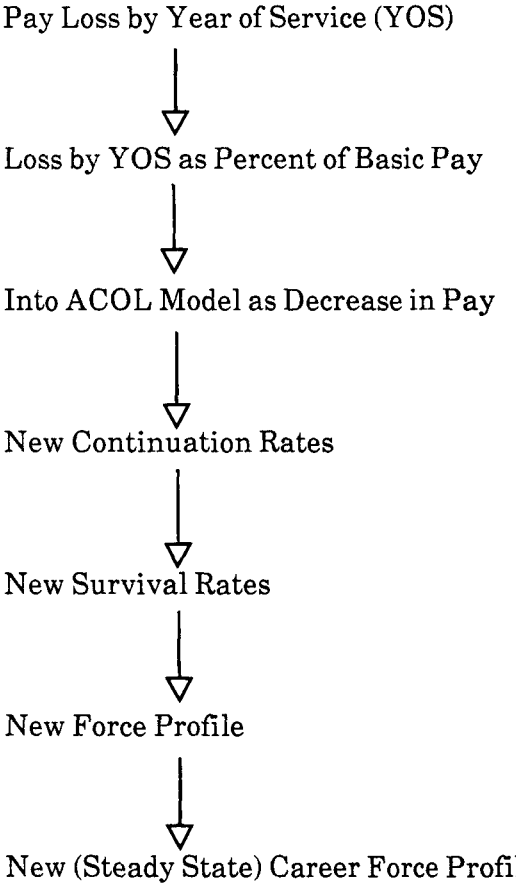
$$p(N_1 \mid N_0) = p(N_1 \mid H_0) = p(N_1).$$

The following description begins with an overview of the logic of the ACOL model, and then turns to the two ways that CBO used the model to estimate upper and lower bounds on projected career force losses.

OVERVIEW OF THE ACOL MODEL

The ACOL model relates the reenlistment decision of a service member to a comparison between the present value of the total pecuniary and nonpecuniary returns to leaving military service immediately, the total returns to staying for the optimal number of additional years and then leaving the military, and other factors, such as civilian unemployment rates and members' taste for military service. The optimal additional career is the one that maximizes the net present value of the military career. All things being equal, real increases (decreases) in basic pay bolster (lower) the cost of leaving military service immediately, thus raising (lowering) the reenlistment rates. The change in reenlistment rates can be used to derive new continuation rates which, in turn, lead to a new career force.

The overall process can be represented schematically as follows:



The basic equation for ACOL involves the logit of the reenlistment rate R and is specified as: 1/

$$(1) \quad \ln\frac{R}{1-R} = \alpha + \beta\,\underset{\text{(by YOS)}}{ACOL} + \mu$$

where:

ln = natural logarithm

R = reenlistment rates for those making retention decisions by YOS

ACOL = annualized cost of leaving values

μ = stochastic error term

ACOL values are calculated for the base case using data on the current career force. Reenlistment rates are supplied by the Defense Manpower Data Center (DMDC). Once this information is substituted into equation (1), α and β can be estimated (hereafter referred to as α^* and β^*). Since only a portion of the force is up for reenlistment at any point in time, account must be taken of those not facing reenlistment decisions at the set time in order to arrive at continuation rates for the entire force.

Thus, with the initial reenlistment rates, overall force continuation rates for the base case can be calculated using the following equation:

$$(2) \quad \underset{\text{(by YOS)}}{CONT} = xR + (1 - x)\,(\text{NON-ETS CONT})$$

where:

CONT = continuation rates for the force by YOS

x = fraction of the force up for reenlistment by YOS (a constant supplied by DMDC)

R = reenlistment rates for those making retention decisions by YOS

1. The specification may also include nonpecuniary variables, such as the unemployment rate and surrogates for members' taste for military service.

NON-ETS CONT = continuation rates for those not facing reenlistment decisions

The continuation rates can then be used to yield survival rates where the survival rate for a particular year of service is the product of the probability of reaching that year of service and the continuation rate for that year of service. Given the survival rates (by YOS) and a particular end strength target, it is possible to calculate the number of accessions necessary to obtain the specified target as follows:

$$(3) \quad END = (ACC \times SURV_1) + (ACC + SURV_2) + \ldots (ACC + SURV_{35})$$

$$= \Sigma(SURV_i \times ACC)$$

thus

$$ACC = END/\Sigma SURV_i$$

where:

END = end strength target

ACC = accessions

$SURV_i$ = survival rate to year i

Once the number of accessions corresponding to the specified end strength are obtained, then the distribution of the force can be calculated, as follows:

$$(4) \quad FORCE_i = ACC \times SURV_i$$

Finally, from the force profile, the steady state (career) force profile under the base case can be obtained by including only those with five or more years of service.

Alternatives to the current compensation system can be evaluated by comparing the resulting career force generated under the particular option with the steady state force under the base case. For example, if an alternative option results in a loss in pay, then new ACOL values are calculated. When the new ACOL values are substituted in equation 1 along with the previously estimated values of α^* and β^*, new reenlistment rates can be estimated. These new reenlistment rates can then be used in equation 2 to estimate new continuation rates, new survival rates, and finally a new career force profile.

APPLICATION OF ACOL IN THE STUDY

As outlined above, the ACOL model can be used to evaluate changes in the steady state career force under various scenarios. However, the application of ACOL in the CBO study required some adjustments: (1) to focus on the direct effect of the MHTP changes in the double tax benefits enjoyed by current military homeowners, and (2) to provide an estimate that takes some account of the probable effect on those who may anticipate becoming homeowners at some point in the future.

The first estimate--the impact on current military homeowners--calls for some deviation from the procedure described above because there is no steady state force consisting entirely of homeowners. Consequently, when the changes in continuation rates by YOS are derived under the alternative that eliminates the double tax benefits, they are multiplied by the distribution of current homeowners (by YOS) rather than by the distribution of the entire current force. This procedure assumes, in effect, that no non-homeowner would be affected by loss of the double tax benefits, and that homeowners would bear the full brunt of the change. Both groups, therefore, are assumed to respond myopically. (The current distribution of homeownership is also assumed to be stable.) Inasmuch as no nonhomeowners would be affected by the tax change, this estimate may be viewed as a lower bound.

The second estimate also requires some modification in the ACOL procedure in order to include the possible effects of the loss in double tax benefits on those current nonhomeowners who anticipate owning a home during their military career. Ideally, one would like to have longitudinal data on the probabilities of homeownership as well as estimates of the elasticities of retention to different elements of the overall compensation package. In the absence of such data, the estimating procedure used in this

study relied on a weighted average of the effects that would be experienced by current homeowners. Specifically, the annual loss for homeowners in each year group was calculated and then the weighted average annual loss for all members in each year group was derived, where the weights were the proportions of owners and nonowners. Then the present value of the compensation stream, reduced by the weighted average annual losses, was calculated. This new compensation stream generated new continuation rates through the use of ACOL. The remainder of the ACOL procedure then proceeded as outlined above. This should provide an upper bound because this use of average reductions, coupled with the logit specification, will overestimate retention effects.