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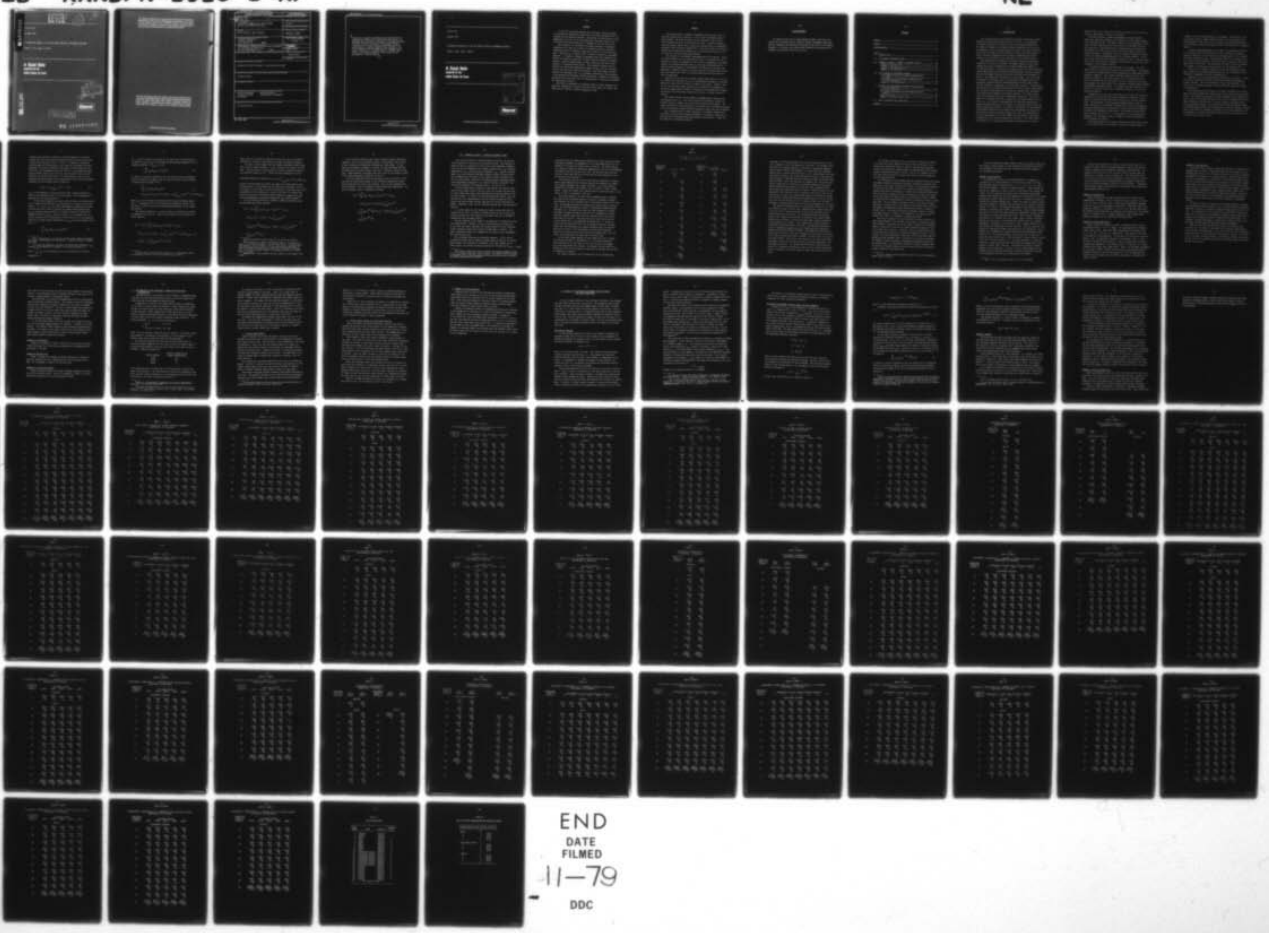

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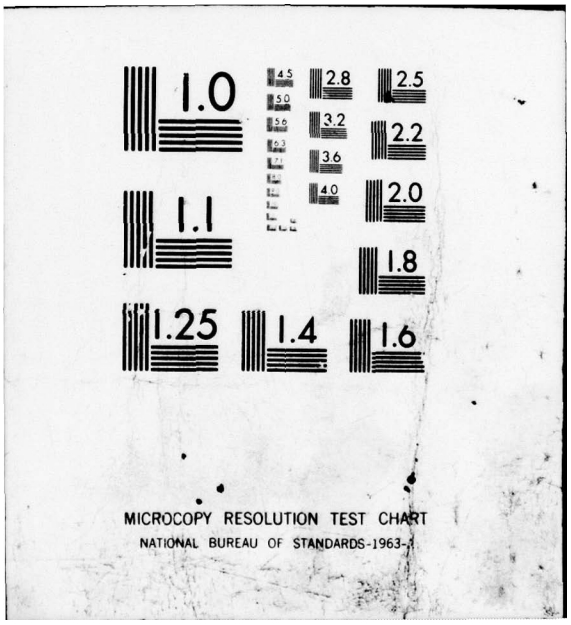
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Glenn A. Gotz, John J. McCall

A Rand Note
prepared for the
United States Air Force

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A stochastic dynamic programming model that explicitly examines the incentives to retire from the military is developed and numerically evaluated. The dynamic program includes the most significant institutional factors affecting an Air Force Officer's retirement decision; actual data on promotion probabilities, officer's pay and allowances, and retirement pay are embedded in the model. The note is a progress report; research generalizing the model presented in this note will be presented in a future report.

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PREFACE

As the cost of defense manpower has increased, various elements of the military compensation system have come under examination by the Congress and the Executive Branch. Particularly visible because of its magnitude is the cost of the non-disability retirement system, and it is possible that this system will be changed in the next few years.

The evaluation of alternative retirement systems is necessarily incomplete if it does not account for changed incentives, and hence changed patterns of retention, among those subject to the revised systems. This Note is a progress report on Rand's research on retirement behavior. It develops a dynamic programming model that explicitly examines the financial incentives to retire under alternative retirement systems. Research generalizing the model presented here will be published in a forthcoming Rand Report. This research accounts for differences in tastes and opportunities among officers, and for transient factors that may alter retention decisions. The final stage of Rand's research on retirement will be to estimate statistically the parameters of the generalized retirement decision model and to examine the retention, personnel force structure, and cost implications of alternative personnel and compensation policies.

This Note was prepared for the Deputy Chief of Staff, Manpower and Personnel, Headquarters, United States Air Force, under the Project AIR FORCE project "Officer Personnel Management Study."

SUMMARY

This Note develops a dynamic programming decision model that explicitly examines the incentives to retire under alternative retirement systems. The model includes the most important institutional factors affecting an Air Force officer's career: promotion probabilities and timing, regular force integration probabilities, and mandatory separation and retirement probabilities. The model embeds the officer's income for each potential combination of future grade and year of service and his civilian income opportunities.

Two versions of the dynamic programming model are examined. First, the decision model for the risk-neutral officer is developed and the incentives to retire are examined for the current nondisability retirement system, the proposed Uniformed Services Retirement Modernization Act, and the recent proposal by the President's Commission on Military Compensation. Numerical results for these cases are presented using actual data from Fiscal Year 1970 for nonflying officers who entered the Air Force through ROTC.

Analysis of the current retirement system lends support to the common belief that retirement pay is an overwhelming inducement for officers beyond the tenth year of service to remain in the force. However, analysis of the two other plans indicates the possibility of designing alternative systems wherein officer's incentives are fundamentally changed, yet without inflicting large deleterious effects on present values of incomes.

The second version of the dynamic programming model addresses the risk-aversion case, i.e., Air Force officers are assumed to prefer the average value of a gamble over actual participation in the gamble. Because the results of this analysis do not greatly alter conclusions reached in the risk neutral setting, extensive numerical results are not presented.

The remaining tasks in Rand's analysis of retirement behavior are to develop a theory of how retention behavior is related to financial incentives, and to estimate these relationships statistically. These are the subjects of forthcoming reports.

ACKNOWLEDGMENTS

The authors would like to thank Misako Fujisaki, who did an excellent job of computerizing a flexible dynamic programming algorithm, and Fred Finnegan, who developed the empirical data used in the dynamic programs. The authors also thank Gordon Crawford and Susan Hosek for comments on an earlier draft of this note.

CONTENTS

I. INTRODUCTION

The existing military non-disability retirement system may undergo significant modification within the next few years. The Department of Defense submitted the Uniformed Services Retirement Modernization Act (RMA) to Congress; the Defense Manpower Commission and other military manpower critics proposed various revisions to the rules governing tenure and retirement vesting privileges; and the President's Commission on Military Compensation has recently recommended substantial changes to the structure of the compensation and retirement system.

The evaluation of alternative retirement systems is necessarily incomplete if it does not consider the changed incentives and, hence, changed patterns of retention and retirement among those subject to the revised systems. This Note is a progress report on research directed toward quantifying the relationships among personnel policies, compensation and retirement policies, and officer retention and retirement behavior. The research has progressed in three stages. The first stage, the subject of this Note, was to characterize the method by which an individual (present-value-of-income-maximizing) officer might choose the best timing for separating or retiring from the force. This approach concentrates on the financial incentives facing the officer--those financial incentives being affected by promotion, regular force integration, and separation and mandatory retirement policies. Of course, factors other than financial ones affect individuals' decisions. The second stage of the research has been to generalize the model presented in this Note, i.e., to account for heterogeneity in tastes and opportunities among individual officers and to account for transient factors which may disturb retention decisions. The explicit introduction of heterogeneity and transient factors can profoundly alter predictions of retention behavior under alternative policy regimes and, hence, the desirability of these alternatives. For this reason we do not dwell on the policy implications of the results contained in this Note. The final stage of the research is to statistically estimate the parameters of the more

general model and to examine the retention, personnel force structure, and cost implications of policy alternatives.

This Note develops a dynamic programming retirement decision model that explicitly examines the incentives to retire under alternative retirement systems. The model includes the most important institutional factors affecting an Air Force officer's retirement decision. The inclusion of these institutional considerations has complicated the analysis to such an extent that we have been unable to prove any general theorems. Consequently, we have resorted to numerical evaluation of the dynamic programming model of retirement behavior. As far as we know, this numerical analysis is unique in that it contains actual data on Air Force officers' promotion probabilities, officers' pay and allowances, and retirement benefits.

The numerical analysis was performed in two stages. The first stage treats the case where officers are risk indifferent. The analysis is relatively straightforward, being unencumbered by complicated utility-theoretic arguments. The optimal retirement behavior derived from numerical analysis of this risk neutral case is consistent with the actual retirement patterns observed in Air Force retention statistics. This suggests that this version of our dynamic retirement model possesses considerable explanatory power. On average, *Air Force officers do behave as if they were making their retirement decisions in an optimal sequential fashion.*

Assuming the truth of this proposition, we altered several key parameters in the model and observed the behavioral responses. The parameters included civilian pay levels, military pay, and the discount rate. The provisions of the Retirement Modernization Act and the recent proposal of the President's Commission on Military Compensation were also modelled and the sensitivity of these results were examined by varying the parameters listed above. The purpose of these sensitivity analyses was to determine the robustness of conclusions about changes to the retirement system to changes in these key parameters. Our conclusions are robust.

The second stage of our analysis addresses the risk aversion case, i.e., Air Force officers are assumed to prefer the average value of

a gamble over actual participation in the gamble. Presentation of the risk averse analysis roughly parallels that of the risk neutral case. The exception is that results of the sensitivity analyses and alternative retirement systems are summarized rather than presented in extensive tables.

A dynamic programming model of retirement is developed in Section II for officers who are indifferent to risk. Section III contains a numerical analysis of the risk neutral retirement model for the current Air Force retirement system. The numerical results are presented first for a base case with parameter values set equal to those in effect during the 1970 fiscal year. The sensitivity of these results is examined for changes in civilian pay, military pay, and the discount rate.

Section IV is a numerical analysis of the two alternative retirement systems, the Retirement Modernization Act and the proposal by the President's Commission on Military Compensation.

Analysis of the risk averse model is presented in Section V. First, the utility function is presented and certain technical problems are briefly reviewed. Then, the procedure by which risk aversion is inserted into the dynamic program is described and the numerical results are summarized.

The concluding section discusses the policy relevance of our findings and outlines additional research that will be reported in subsequent papers. The additional research includes estimation of retirement functions using the data developed here on the costs of leaving the military. These statistical functions will be used to predict retirement rates under alternative systems. The contribution of the risk aversion model to improving predictions about retirement rates will be assessed. Finally, these results will be integrated to conduct a full system evaluation of the impacts of alternative retirement systems on the structure and cost of the Air Force officer corps.

II. THE DYNAMIC RETIREMENT MODEL

We have developed a dynamic model of retirement to enhance our understanding of the behavioral effects of alternative retirement systems. Officers are assumed to be risk-neutral, that is, they choose to stay or leave solely on the basis of which choice maximizes the expected present value of future income. No adjustments are made for differences in the riskiness of income. The dynamic program calculates the return from each decision. The complete set of calculations includes the higher value of the return function, i.e., the maximum expected present value, the optimal decision (stay or leave) associated with the higher value of the return function, and the difference between the returns from the optimal and suboptimal decisions. The last calculation, the difference between the returns, reveals the importance of making the correct decision and later will provide strong clues as to the probable responses of officers to alternative retirement systems. The analysis explicitly considers the supplement to post-Air Force income flowing from the pension that has been accrued at the retirement decision point.

The dynamic retirement model has the following structure. Let $i = 1,2,3, \ldots, 26$, denote the twenty-six mutually exclusive combinations of grade, promotion timing group, and component (regular or reserve). In the analysis each of these combinations is a state. The grades run from captain through colonel. For each grade above captain, each promotion timing group is a range of years of service for having been promoted to that grade and there are four of these ranges per grade.* For example, $i = 10$ ($i = 9$) represents regular major having been promoted to major in the eighth, ninth or tenth (eleventh or twelfth) year of service. States numbered one and two are reserve and regular captain respectively. The civilian state is numbered twenty-seven.

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*See the Appendix for the detailed state listing and the years of service over which effective dates of rank were aggregated.

Movement among the grades, promotion timing groups, and components are assumed to be generated by a first-order Markov chain with transition probabilities P_{ijt}, $i = 1,2, \ldots, 26$; $j = 1,2, \ldots, 27$; $t = 4,5, \ldots, 30$, where t refers to year of service. Thus, P_{ijt} is the probability of going to state j, say, regular major, in the next period given that this period's state occupied is i, say, reserve captain, and the year of service in this period is t. Demotions are extremely rare in the Air Force so it is assumed that $P_{ijt} = 0$ whenever $j < i$. This, of course, implies that the Markov matrix P of transition probabilities is upper triangular. The upper triangular portion of the Markov matrix is also dominated by zero entries reflecting the impossibility of most one-period promotions like captain to colonel, the assumed zero probability of moving from regular to reserve component, and certain obvious restrictions on moving from one promotion timing group to another. The individual faces the Markov matrix P only if he chooses to remain at least one more year, i.e., the P_{ijt} are conditional on not voluntarily leaving the force. Note that $P_{i,27,t}$ is the probability of being *involuntarily* separated or retired.

Military pay (basic pay plus basic allowances for quarters and subsistence)* depends on grade level and year of service and is denoted by m_{it} where the subscript ranges have been noted above. Furthermore, if an officer leaves the force from i upon completing t years of service, the fraction of basic pay that is collected per period is r_t, the pension parameter, $0 \leq r_t < 1$.** At each stage of the decision process an officer in state i may leave the Air Force and receive a retirement income of $r_t (m_{it} - a_{it})$ each period, where a_{it} is the allowances not counted in the retirement pay calculations. Search in the

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*Allowances are not taxable and basic pay is calculated on an after federal income tax basis.

**The current formula for r_t is:

$$r_t = \begin{cases} 0 \text{ if } t < 20 \\ .025t \text{ if } 20 \leq t < 30 \\ .75 \text{ if } t \geq 30 \end{cases}$$

civilian labor market is assumed to proceed immediately in optimal fashion with $C_t(i)$ denoting the optimal return from search with state i having been achieved in the Air Force.* In general, a different civilian wage offer distribution, F_{it}, might be associated with each grade/year of service combination from which the individual left the Air Force, the presumption being that there is a relationship between grade achieved, age at entry into the civilian labor force, and productivity in the civilian sector. For now we merely note that the expected discounted return from leaving the Air Force now and searching optimally in the civilian sector is given by:

$$r_t (m_{it} - a_{it}) \sum_{j=t+1}^{\infty} s_{tj} \beta^{j-t} + C_t(i) . \qquad (1)$$

s_{tj} is the probability of surviving until year j given survival at t and β is the discount factor ($\beta = 1/(1+\rho)$ where ρ is the individual's marginal rate of time preference).

If the officer chooses to remain in the Air Force, he moves according to transition probability P_{ijt} from state i to state j in the next period. If $j \leq 26$, i.e., he is not involuntarily separated or retired from the Air Force, then he receives the single period compensation $m_{j,t+1}$ and again chooses whether to remain or leave and receives the optimal return of $V_{t+1}(j)$. The exact value of j is unknown, but the return at period t+1 to remaining in the Air Force at t is the expected value of the single period compensation, $m_{j,t+1}$, plus the optimal return at t + 1.

$$\sum_{j=1}^{26} P_{ijt} (m_{j,t+1} + V_{t+1}(j)).** \qquad (2)$$

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*For a discussion of this finite horizon search model, see Lippman and McCall, "The Economics of Job Search: A Survey," *Economic Inquiry*, June 1976.

**In this and subsequent equations the transition probability P_{ijt} includes the probability of survival to t+1 given survival at t. Thus $1 - \sum_{j=1}^{27} P_{ijt}$ is the probability of not surviving till t+1 given survival at t.

At t years of service his return for the next year is discounted by β so that the total return from staying in and behaving optimally for the remaining periods, if $P_{i,27,t} = 0$ is

$$\beta \sum_{j=i}^{26} P_{ijt}(m_{j,t+1} + V_{t+1}(j)) \tag{3}$$

If there is a nonzero probability that the officer will be terminated even if he desires to remain, then the return associated with becoming a civilian must be added to (3):

$$\beta \sum_{j=i}^{26} P_{ijt}(m_{j,t+1}+V_{t+1}(j)) \tag{4}$$
$$+ P_{i,27,t}[\beta s_{t,t+1}\, x_{it} + r_{it}(m_{it} - a_{it}) \sum_{k=t+1}^{\infty} s_{tk}\, \beta^{k-t} + C_t(i)]/s_{t,t+1}$$

where x_{it} is any severance pay associated with the involuntary separation.* Expression (4) is the return from choosing to remain in the Air Force at least one more year and behaving optimally for the remaining periods.

The optimal decision at t, stay or leave, is obtained by choosing the maximum of (1) and (4). Thus, we have derived the following functional equation:

$$V_t(i) = \max \{\beta \sum_{j=i}^{26} P_{ijt}(m_{j,t+1} + V_{t+1}(j)) + P_{i,27,t}$$

$$[\beta s_{t,t+1}\, x_{it} + r_{it}(m_{it} - a_{it}) \sum_{k=t+1}^{\infty} s_{tk}\, \beta^{k-t} + C_t(i)]/s_{t,t+1};\tag{5}$$

$$r_t(m_{it} - a_{it}) \sum_{k=t+1}^{\infty} s_{tk}\, \beta^{k-t} + C_t(i)\}$$

*In the current system severence pay, x_{it}, is only paid to those not eligible to retire, so if r_t is positive x_{it} is zero.

where $V_t(i)$ is the expected discounted return when the decisionmaker (officer) is in state i and follows an optimal retirement strategy.

At first, it was thought that the optimal retirement policy would have a fairly simple structure. So far, this has not proved to be the case. For this reason it was decided to perform a numerical analysis of a modified version of (5). Search has been eliminated from the functional equation by replacing $C_t(i)$ with $\sum_{j=t+1}^{T} s_{tj} \beta^{j-t} w_{ij}$ where w_{ij} are the civilian wages the officer can expect to receive when he has achieved state i at retirement and the time since retirement is j-t+1. T is taken to be the year of service equivalent of sixty-five years old.* In addition to the elimination of search, note that (5) assumes that officers have perfect information about promotion, augmentation, and force-out/mandatory retirement probabilities and civilian wages.**

In the following section we consider a numerical analysis using the following functional equation:

$$V_t(i) = \max \{ \beta \sum_{j=1}^{26} P_{ijt}(m_{j,t+1} + V_{t+1}(j)) + P_{i,27,t} \left[\beta s_{t,t+1} x_{it} + r_t (m_{it} - a_{it}) \sum_{k=t+1}^{\infty} s_{tk} \beta^{k-t} + \sum_{k=t+1}^{T} s_{tk} \beta^{k-t} w_{ik} \right] / s_{t,t+1}; \; r_t (m_{it} - a_{it}) \sum_{k=t+1}^{\infty} s_{tk} \beta^{k-t} + \sum_{k=t+1}^{T} s_{tk} \beta^{k-t} w_{ik} \} . \quad (6)$$

---

*Pensions acquired after leaving the Air Force are ignored.

**The assumption of perfect information about P, the transition matrix, is not very stringent. The *Air Force Times*, a weekly publication found on virtually every Air Force installation, publishes detailed breakdowns of promotions by component, aeronautical rating, etc. Also, the infrequent changes in promotion policies are usually known in advance.

Augmentation is the movement from the reserve to the regular component.

This functional equation must satisfy several boundary conditions imposed by the Air Force promotion system. Specifically, there exists a year of service for mandatory retirement for each grade. At that year the individual is assumed to receive the same retirement pay and civilian pay as he would receive if he were a voluntary retiree at that year. These mandatory retirement years are clear in the context of each of the cases presented in Chapters III and IV.

It is our expectation that the retention rate for a group of officers will be positively related to the difference between the return from staying and the return from leaving. Thus, in the following section we present a cost of leaving for each state/stage combination. The cost of leaving, $c_t(i)$, is defined as follows:

$$c_t(i) \equiv \beta \sum_{j=i}^{26} P_{ijt} [m_{j,t+1} + V_{t+1}(j)] + P_{i,27,t}$$

$$[\beta s_{t,t+1} x_{it} + r_t (m_{it} - a_{it}) \sum_{k=t+1}^{\infty} s_{tk} \beta^{k-t}$$

$$+ \sum_{k=t+1}^{T} s_{tk} \beta^{k-t} w_{ik}]/s_{t,t+1} - r_t (m_{it} - a_{it}) \sum_{k=t+1}^{\infty} s_{tk} \beta^{k-t}$$

$$- \sum_{k=t+1}^{T} s_{tk} \beta^{k-t} w_{ik} \qquad (7)$$

III. NUMERICAL RESULTS: CURRENT RETIREMENT SYSTEM

This section provides a detailed numerical analysis of the functional equation (6) derived in the previous section. The analysis is unique in that it contains Air Force data on the promotion, augmentation, and force-out/mandatory retirement probabilities, P_{ijt}, military compensation, m_{it}, and the pension parameters, r_{it}. Data on civilian wages, w_{it}, were obtained from Rand's Medical Survey of Retired Military Personnel and the Bureau of the Census' Current Population Survey for professional, technical, and kindred workers excluding obvious noncorresponding occupations (e.g., medical doctors, dentists).* Unless stated otherwise, the discount rate, ρ, is set at .10.

At each stage (year of service) of the process the officer evaluates (6) and either stays in the Air Force for at least one more year or leaves based upon which choice maximizes the expected present value of future income. In effect, we are calculating the present value and decision for the "representative" officer facing the mean Air Force career path and the mean civilian wage path for retired military personnel. Needless to say, not all officers display this "representative" behavior.

In a later paper we will relate the optimal values and costs of leaving the Air Force to actual retirement rates and thus obtain quantitative estimates of the change in retirement rates due to changes in compensation and retirement policy.

We have examined a wide range of rating/source of commission/fiscal year combinations. However, for ease of presentation we concentrate on the base case which considers the optimal behavior of the "representative" nonrated officer who accessed through ROTC or OTS/OCS. The other combinations which were examined do not differ in any fundamental way from the base case.

The retirement plan has the following features: if the officer voluntarily leaves before completing twenty years of service, no retirement benefits are received; if retirement occurs upon completion of twenty years, the retiree receives 50 percent of the base pay $(m_{i,20} - a_{i,20})$

*The Current Population Survey provided the average earnings by age for all civilians rather than just retirees. The Medical Survey provided an estimate of the civilian earnings difference between retired colonels and lower-ranking retired officers.

associated with the highest grade achieved; for every year after twenty the pension parameter is augmented by 2 1/2 percentage points up to a maximum of 75 percent at thirty years of service. The Markov matrix, P, is based on empirical promotion, augmentation, and force-out/mandatory retirement rates from fiscal year 1970. The military pay scales are also for fiscal year 1970 and civilian pay has been adjusted so as to correspond to the same year.

The numerical results from the base case are presented in Table 1. Rather than presenting all promotion groups and components we present only regular component "due course" officers, i.e., those officers promoted in the phase point (modal) year of service to their current grades. Where the results vary significantly by promotion group or component it will be discussed in the text.

The first column of the table shows completed years of service. We focus on the retirement behavior of majors, lieutenant colonels, and colonels, but as a reference note in the second column of the first row: the optimal decision for captains after seven years of service, stay; the discounted expected return of following an optimal policy, $142,000, i.e., staying for one more year and following an optimal retirement strategy thereafter; and the cost of making an incorrect decision, $34,000, which here would be leaving the Air Force after seven years of service. The three entries in each year-of-service row for majors have a corresponding interpretation. It should be noted that calculations of the cost of making an incorrect decision assume that the individual does behave optimally after the mistake. This has no effect on the calculation for those who incorrectly leave the Air Force several years before the optimal point, but does affect the calculations for those who incorrectly stay.

To facilitate understanding, we have signed the cost of making an incorrect decision by calculating it as the return associated with remaining in the Air Force for at least one more year <u>minus</u> the return associated with leaving. The signed cost may then be interpreted as the cost of leaving the military if positive and the cost of remaining if negative.

The common conception that retirement pay is an overwhelming

Table 1

BASE CASE - BETA = .9091
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	CAPTAIN	MAJOR	COMPLETED YEARS OF SERVICE	LIEUTENANT COLONEL	COLONEL
7	STAY 142 34		20	STAY 175 7	
12		STAY 155 45	21	STAY 176 6	
13		STAY 157 48	22	STAY 175 2	S/L 199 0
14		STAY 160 51	23	S/L 175 0	STAY 201 1
15		STAY 163 54	24	S/L 175 0	STAY 203 3
16		STAY 165 57	25	S/L 176 0	STAY 206 4
17		STAY 157 49	26	LEAVE 177 -1	LEAVE 209 -2
18		STAY 157 50	27	LEAVE 177 -2	LEAVE 209 -2
19		STAY 158 52	28	MAND. RETIRE. 177	LEAVE 210 -2
20		LEAVE 160 -1	29		LEAVE 209 -3
21		LEAVE 161 -1	30		MAND. RETIRE. 209
22		MAND. RETIRE. 162			

inducement for officers between the tenth and twentieth years of service to remain in the force appears to be correct. The optimal retention policy for majors--optimal in the sense of maximizing expected present value--(reserve and regular) is to stay until they complete twenty years of service and then retire. For a regular major with nineteen years of service, the discounted expected return of following an optimal policy is $158,000 and the difference between staying and leaving is $52,000. After an individual is eligible for a 50 percent pension at twenty years of service the difference between leaving (the optimal decision) and staying is relatively small, roughly $1,000 after twenty and twenty-one years of service. Since we expect that the magnitude of the retention rate is related to the size of the cost of leaving the Air Force, our calculations indicate that while we should never observe a major quitting after nineteen years of service, we may very well see some desiring to stay in beyond twenty-two, the small advantage to leaving being offset by factors not measured with our data.

The optimal retirement policy for lieutenant colonels is for regular officers to stay at least until completing their twenty-third year of service and for reserve officers to stay until completing their twenty-second year of service. The difference between the optimal policies for regulars and reserves, if reserves could remain beyond twenty years of service, is that the former have a higher probability of being promoted to colonel. For a regular due course lieutenant colonel with twenty-two years of service, the discounted expected return of following an optimal policy is $175,000 and the difference between staying and leaving is $2,000. From twenty-two until twenty-seven years of service, the cost of making the wrong decision for regulars varies from less than $500 to $2,000. For most cases, the loss is less than $1,000. Other factors not measured by our data could cause lieutenant colonels in this age interval to make the financially less advantageous decision. The optimal decisions before twenty years of service for lieutenant colonels are stays, and the optimal returns and costs of leaving are uniformly higher in those years than they are for majors.

The optimal retirement policy for colonels (regular and reserve) is to stay until they complete twenty-six years of service. For a colonel with twenty-five years of service, the discounted expected return from following an optimal policy is $206,000 and the difference between staying and leaving is $4,000. The cost of remaining in the Air Force from twenty-six to twenty-nine years of service ranges between $2,000 and $3,000.

The differences in the optimal decisions between reserve and regular lieutenant colonels and between lieutenant colonels and colonels are important in that they illustrate the effect of pay patterns on behavior. The reserve lieutenant colonel with no chance of being promoted to colonel would have an inducement to remain until completing twenty-two years by the pay increase received at completion of twenty-two years.* By the same token, the colonel faces his last pay increase at twenty-six years and the "representative" colonel is induced to remain at least that long. For the regular lieutenant colonel, the chance of being promoted to colonel involves the chance of both higher active duty pay and higher retirement pay thereby inducing the officer to remain in the Air Force. In moving from reserve lieutenant colonel to regular lieutenant colonel to colonel, the opportunity for higher income increases and, hence, the incentive to remain increases.

The costs of making the "wrong" decision for these officers are small when compared to the optimal returns which are generally larger than $150,000. Therefore, one cannot expect a pattern of retirements wherein virtually all officers in a given grade and component retire in the same year of service. (However, as will be shown below, such a pattern may be induced with a different retirement system.) Nevertheless, for those retiring in fiscal year 1970 we find that both the median and mean completed years of service at the time of retirement for regular colonels (nonrated, nonacademy) were between twenty-six and twenty-seven. For lieutenant colonels the median completed year of service was between twenty-three and twenty-four and the mean was between twenty-four and twenty-five.

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*In fact, reserve officers generally must retire upon completing twenty years of service.

Since the average retirement behavior under the current system (our base case) is quite similar to that predicted by the model, this gives us confidence in the model and also in predictions about changes in the retirement parameters.

CHANGES IN CIVILIAN PAY

We examined the effects on retirement behavior of changes in civilian pay, *all other parameters of the base case being held fixed.* We multiplied annual civilian pay by .7, .8, .9, 1.0, 1.1, 1.2, and 1.3 and observed changes in optimal retirement behavior. These optimal responses are summarized in Table 2 where we first report the optimal decision, then the expected discounted return associated with optimal behavior, and finally the loss from making the wrong decision.* Of course, multiplying by unity replicates the base case. As expected, departures increase as civilian earnings rise. Rather than leave at twenty, majors stay until mandatory retirement when earnings in the civilian sector are reduced to .7 and .8. The expected discounted return from this optimal strategy is $133,000 and $141,000, respectively. When civilian earnings increase to .9 of the base case, majors are indifferent between leaving and staying at twenty and twenty-one years. When civilian earnings are multiplied by 1.3, majors stay until twenty years to obtain retirement benefits but the cost of not leaving after twenty years is no longer negligible. Therefore, we would expect to see a higher proportion actually making the "financially correct" decision. With one exception, the behavior of lieutenant colonels and colonels is as anticipated. The exception was the behavior of colonels when civilian earnings were multiplied by 1.3. The optimal behavior for this case was to leave after each year except twenty-five. This illustrates a case in which a control limit rule of forms, retire if $x \geq \xi$ and stay otherwise, is violated. Initially, we had conjectured that the optimal retirement policy would possess a control limit structure. This behavior provides a counterexample to this conjecture. The source of the counterexample is the longevity pay increase received after completing twenty-six years and the corresponding increase in retirement pay for colonels.

*Table 2 and all subsequent tables are in the Appendix.

We note that variations in civilian income opportunities do not produce the same effects on optimal decisions, returns, and costs of incorrect decisions as do opposite variations in military pay. The reason for this is that not all civilian income is forgone when the decision is to remain at least another year. The officer may leave the Air Force no later than upon completion of thirty years of service so he has thirteen years (assuming complete retirement at age sixty-five) of civilian earnings to which he can look forward. Therefore, some civilian income is discounted into the optimal return associated with remaining another year.

CHANGES IN MILITARY PAY

Table 3 presents the optimal retirement policies when military compensation is changed. First, military pay m_{it} is reduced to .8 and .9 of its value in the base case. (This was accomplished by changing basic pay, $m_{it}-a_{it}$, by even greater proportions.) Then basic pay is increased so that m_{it} is increased to 1.1 and 1.2 of the base case value. The purpose of this exercise is to measure the sensitivity of the optimal policy to changes in pay. A ragged response to these changes would diminish confidence in the underlying retirement model.

CHANGES IN THE DISCOUNT FACTOR

Table 4 shows the changes in optimal retirement behavior as the discounted factor $\beta \equiv 1/1 + \rho$ changes. We investigated four different values .9524, .9302, .8889, and .8696 corresponding to discount rates, ρ, of .05, .075, .125, and .15, respectively. The format of the table is the same as its predecessors. In the base case the discount rate was equal to .10. As expected, increases in the discount rate, ρ, cause Air Force officers to leave earlier, since the present value of the retirement plan diminishes. For example, when ρ = 5 percent (β = .9524), colonels leave after twenty-eight years. When ρ (β) increases (decreases) to 15 percent (.8696), colonels leave soon after achieving that grade. Captains continue to stay for all values of β, but the expected discounted return decreases from $272,000 to $91,000 as β decreases from .9524 to .8696.

SUMMARY OF THE BASE CASE

Given the rather stringent assumptions imposed on the dynamic programming model in order to numerically simulate the decisions of the representative officer, it is notable that we have been able to closely approximate the behavior of the median officer. When the incentives to retire are examined it is found that the existing retirement system does not provide strong incentives for staying in the military beyond twenty years of service though the disincentives are not great either. These results are sensitive only to extremely large changes in civilian and/or military compensation rates, changes unlikely except under a radical modification of the military compensation system. One reason for these robust results is the assumption that individuals making mistakes in the current period will behave optimally in subsequent periods.

As might be expected, longevity pay-increases (fogies) and promotion probabilities play prominent roles in inducing officers (primarily lieutenant colonels) to postpone retirement beyond twenty years of service. The combination of the pay fogey upon completion of twenty-two years plus the larger pension parameter produces a strong financial inducement for lieutenant colonels to remain beyond twenty years. For colonels, the additional fogey at completion of twenty-six years plus the higher pension parameter provides a similar inducement.

While the existing retirement system does not provide strong incentives for retirement in any given year of service beyond twenty, it does provide the inducement to *stay in* the military until completing twenty years for officers beyond the tenth year of service. The value of the retirement vesting privilege is particularly visible when examining the cost to the nineteen-year major of separating today versus completing one more year.

IV. TWO ALTERNATIVE RETIREMENT SYSTEMS

Depending on the desired structure of the officer force, there are innumerable alternatives to the existing retirement compensation system. In this section we evaluate the effects on officers' incentives to retire of two proposed retirement systems: the Uniformed Services Retirement Modernization Act and the recent proposal by the President's Commission on Military Compensation.

In each of the alternatives presented below, the promotion rates and other transition probabilites are assumed to be unchanged. The only exception to this statement is that we also evaluate the proposal by the President's Commission under a thirty-year-of-service tenure policy for field grade officers,* although even in this case we do not alter the promotion and augmentation probabilities. After development of statistical functions for the prediction of retirement rates under alternative systems we will be able to examine the required changes in promotion rates and thereby in retirement rates required to satisfy limits on the number of officers in each grade.

1. THE UNIFORMED SERVICES RETIREMENT MODERNIZATION ACT (RMA)

There are three provisions of the RMA which are examined in this section. First, for those officers leaving the military after having completed at least twenty years of service, the pension parameter, r_t, is now calculated according to:

$$r_t = .025 \min(t, 24) + .03 \max(0, t-24) \qquad (r_t \leq .78)$$

where t is the officer's completed years of service. If the number of years since beginning service is less than thirty, .15 is subtracted from r_t. This is in contrast to the two and one-half percentage points per completed year in the current retirement system. It represents a

*In the base case the mandatory retirement years were completion of twenty-two, twenty-eight, and thirty years for majors, lieutenant colonels, and colonels, respectively.

substantial decrease in the present value of retirement benefits for those completing at least twenty but fewer than thirty years of service. Second, those officers leaving voluntarily after having completed at least ten but less than twenty years of service are also eligible for retirement pay with the pension parameter described by the formula above. These officers may not begin collecting the retirement pay until reaching age sixty, however. Currently, no such vesting exists. Third, those officers involuntarily separated from the military under honorable conditions receive a choice as to the type of severance award received: a lump sum payment of 5 percent times completed years of service times basic pay plus the deferred retirement annuity described for voluntarily separating officers, or double the lump sum payment with no deferred retirement annuity.

At a 10 percent discount rate it was found that for the case of the involuntarily separated officer the double lump sum payment was roughly $4,000 larger than the single lump sum plus the present value of the deferred retirement annuity. Since we were somewhat cavalier in treating the after-age-sixty-five income tax rates this cannot be taken as a strong statement that all officers would choose the double lump sum, but we expect that it would be the option most frequently chosen.*

The value of the early retirement/deferred retirement annuity, again calculated at a 10 percent discount rate, ranges from approximately $1,000 for a major completing ten years to $6,000 for a major completing nineteen years. As the tables indicate, the cost of leaving the Air Force in these years of service is very large relative to these values and we would not expect the institution of this vesting right in these years of service to cause any significant number of losses.

Table 5 presents the optimal decisions, returns, and costs of incorrect decisions under the provisions of the RMA. The base case is also reproduced in the table. First note that while there are substantial changes in the costs of incorrect decisions compared to the base

*We did not implement the provision of the RMA calling for reduced retirement pay when Social Security benefits are being received. This, of course, diminishes the value of the deferred annuity plan even further.

case there is only one group that also has large changes in the optimal returns. The exceptional group is composed of majors with little or no chance of being promoted to lieutenant colonel.

The provisions of the RMA are unambiguously worse for these majors than the existing retirement system. The optimal returns for lieutenant colonels and colonels are slightly reduced *but the optimal retirement policies are quite different*. For each of these grades the optimal retirement year is two or more years later under the RMA than under the current retirement system. For those officers completing at least twenty years, the costs of leaving the military uniformly increase, thereby inducing the longer retention.

It is also interesting to note that neither the optimal return nor the cost of leaving change markedly for captains. A caveat is in order, however. The analysis takes promotion rates (promotion opportunities) as fixed. If, because of the longer retention of field grade officers, these promotion rates should drop in order to satisfy grade limits, then captains would be adversely affected.

Changes in Civilian Pay

Table 6 is identical to Table 2 except that the effects of proportional variations in civilian pay are measured after implementing the provisions of the RMA.

Changes in Military Pay

Table 7 displays the optimal retirement responses to changes in military compensation after implementation of the provisions of the RMA. It corresponds to Table 3 for the base case.

Changes in the Discount Factor

Table 8 presents changes in optimal retirement behavior as a function of the discount factor. Table 8 corresponds to Table 4, the only difference being that we are now evaluating the RMA.

2. THE PROPOSAL OF THE PRESIDENT'S COMMISSION ON MILITARY COMPENSATION*

The provisions of the proposal of the President's Commission examined here are the deferred retirement annuity, deferred compensation trust fund and revised mandatory separation pay.

Eligibility to collect a retirement annuity begins at completion of ten years of service under the proposal. Those completing at least ten but not twenty years of service may begin collecting the annuity at age sixty-two. Those completing at least twenty but not thirty years may begin collecting the annuity at age sixty and those completing at least thirty receive the annuity beginning at age fifty-five. The pension parameter, r_t, is calculated according to:

$$r_t = \begin{cases} 0.0 & \text{for } t<10 \\ 0.2125 + 0.0275t & \text{for } t\geq 10 \end{cases}$$

where t is the officer's completed years of service. The annual retirement payment is calculated by multiplying r_t by the average of the highest three years of base pay earned by the individual.

The deferred compensation trust fund has the feature that for each year beyond completion of five years of service an amount equal to a specified percentage of base pay is set aside in the name of the individual. These percentages are:

Year of service	Percent of Base Pay Set Aside for Each Year
6-10	20
11-20	25
21-25	15
26-30	5

In the analysis below we assume that the contributions are after-tax rather than sheltered. The individual may collect his accumulated fund, which includes interest payments at a one percent real rate on past contributions, at the time of leaving the service.**

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*Report of the President's Commission on Military Compensation, Washington, D.C., USGPO, April 1978.

**Allowing withdrawals while on active duty increases the cost of leaving if the individual's discount rate is higher than a one percent real rate. We think it is.

The separation payment for those involuntarily separated differs from the current payment in two ways. First, it is lower than the current payment for those separated earlier than the twentieth year of service. Second, those involuntarily separated after twenty years receive a payment. The formula for the separation payment is one quarter of one month's base pay for each year of service completed up to ten, and one-half of one month's base pay for each completed year of service in excess of ten but less than thirty. There is a maximum of one year's base pay for separation pay but this maximum clearly has no effect except for those completing thirty or more years of service.*

We examine the Commission's proposal below under two sets of tenure rules. The first set corresponds to those in the base case--the currently existing mandatory retirement years for field grade officers. The second set of rules allows all field grade officers to complete thirty years of service should they so desire.

a. Current Tenure Rules

Table 9 presents the optimal decisions, returns, and costs of leaving the military under the provisions of the Commission's proposal and current tenure rules. The base case is also reproduced in the table for reference. First note that the expected value of a career, as measured by the optimal return for the captain, is unchanged *given no change in promotion rates*. However, the costs of leaving have greatly increased for lieutenant colonels and colonels. The magnitudes of the costs of leaving imply a substantial increase in retention rates for these officers.

Also notable are the large reductions in the costs of leaving for majors. The cost of leaving for majors failing to be promoted to lieutenant colonel drops from a base case value of $50,000 at eighteen years to $13,000, implying large losses of majors at that point.

The caveat concerning constant promotion rates bears repeating for this case. The possible increase in the retention rates of lieutenant colonels and colonels might cause serious grade table problems which

*An individual separated after twenty-nine years would receive a separation payment equal to one year's base pay.

might have to be resolved, at least in part, by reducing promotion opportunities to these grades. These reduced promotion opportunities would then be reflected in reduced costs of leaving for captains and young majors.

Tables 10, 11, and 12 display the effects of variations in civilian pay, military pay, and the discount factor, respectively, in the same manner as the variations presented for the base case and the RMA. When compared to similar variations in the base case, it can be seen that conclusions regarding the likely impact of the Commission's proposal are fairly robust with respect to these parameters.

b. Thirty Years' Tenure for Field Grade Officers

Table 13 presents the optimal decisions, returns, and costs of leaving the military under the provisions of the Commission's proposal and with thirty years' tenure allowed for field grade officers. As before, promotion rates have been held constant. The Commission's proposal with current tenure rules is also displayed for reference.

That promotion rates would remain unchanged is very unlikely in this case. The costs of leaving are no less than $30,000 for lieutenant colonels with twenty or more years of service and so it seems likely that most would remain until thirty years of service. The same is true for colonels. In order to maintain the grade tables in the face of such high retention rates, promotion rates to these grades surely would have to decline. Also, the small increase in the cost of leaving for captains is probably illusory since the optimal return for captains would drop as promotion rates to each field grade decline.

While the increased tenure also increases the cost of leaving for majors who fail promotion to lieutenant colonel, this cost is at a minimum at completion of twenty years of service and monotonically rises through thirty years of service. This may imply a pattern of retention for these officers wherein many leave between, say, eighteen and twenty-two years and the rest leave at completion of thirty years of service.

Tables 14 through 16 display the effects of variations in civilian pay, military pay, and the discount factor, respectively.

3. SUMMARY OF THE ALTERNATIVES

Characteristic of each of the alternative retirement systems presented above is the increase in the cost of leaving the military among individuals beyond the twentieth year of service compared to the base case. Each alternative implied a different pattern of optimal behavior from the current system though each implies longer retention among those who complete at least twenty years of service.

Finally, an important reason for examining the effects of variations in the parameters of the model is to test the robustness of conclusions about changes from one retirement system to another. In general, it was found that cross-retirement-plan comparisons of costs of leaving were not qualitatively altered by comparing them at, say, a five percent discount rate rather than a ten percent rate. As long as the parameters are the same for both retirement plans, the influence of the RMA, for example, in inducing longer service among those who complete twenty years of service than does the current system can be seen for any set of values for the parameters.

V. ANALYSIS OF THE DYNAMIC RETIREMENT DECISION MODEL: THE RISK AVERSE CASE

In the preceding analysis of the retirement decision it was assumed that Air Force officers are risk neutral. This assumption was relaxed and the retirement decision was examined when officers have a distaste for risk, i.e., their utility functions display risk aversion. The introduction of risk aversion to a sequential model such as that presented above raises some rather profound issues regarding the temporal resolution of risk. We will indicate the manner in which risk aversion is incorporated into the dynamic retirement model, but give only passing reference to certain unresolved problems which are too complex for presentation here.

THE UTILITY FUNCTION

In the previous chapters the officer was assumed to maximize the expected present value of income. Now, however, the decisionmaker is assumed to maximize the expected utility of the present value of income. The utility function is assumed to be

$$u(x) = -e^{-\lambda x}, \quad \lambda > 0$$

where x is a present value of income. This utility function displays constant absolute risk aversion, i.e., the premium the individual would be willing to pay to avoid a given gamble is independent of his wealth. The parameter λ measures the degree of risk aversion; the larger the value of λ the greater the premium the individual would be willing to pay to avoid the given gamble.

Two considerations have led to the adoption of the utility function above. First, we have no information on the wealth position of the Air Force officers. Thus, we would be unable to validate any risk-aversion parameter that depended on wealth. However, we expect that the variability in wealth is much less than that displayed by civilians of similar ages. Certainly, the human capital component of wealth should exhibit little variability because of the homogenizing influence of an Air Force

career. Consequently, actual data on total wealth would probably display a relatively small degree of variability. Mathematical tractability is the second reason for choosing the constant risk-aversion function. It would be extremely difficult to implement a dynamic program for any other utility function.

Even with the choice of this simple utility function two conceptual problems remain: the derivation of the utility function of income from the underlying utility function of consumption* and the temporal resolution of risk. With respect to the first issue, a simple utility of consumption function does not imply that the utility of income will have the same form or even that it will have a simple form. We do not address this problem here. Rather than specifying a utility function for consumption and deriving the utility of income, we simply assert that the utility of income is an exponential function. For the second issue, the temporal resolution of uncertainty, we have adopted the approach by Porteus. We will briefly describe the essentials of this approach.**

The sequential decision problem may be viewed as a sequence of single-period gambles. In the context of the Air Force officer, each gamble is a promotion gamble, i.e., the lieutenant colonel may be promoted to colonel with probability P_{ijt}, remain a lieutenant colonel with probability P_{iit}, or be involuntarily retired with probability $P_{i,27,t}$. The expected utility of this gamble is calculated as the probability weighted average of the utilities associated with the outcomes. The certainty equivalent of this gamble, x_c, the amount such that the decisionmaker is indifferent between participating in the gamble and receiving x_c for sure, is given by the solution to

$$-e^{-\lambda x_c} = E(u(X))$$

E(u(X)) is the expected utility of the gamble.

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*See Jacques H. Dreze and Franco Modigliani, "Consumption Decisions Under Uncertainty," Journal of Economic Theory 5, pp. 308-335 (1972).

**The interested reader should consult Evan L. Porteus, "On the Optimality of Structured Policies in Countable Stage Decision Processes," Management Science, Vol. 22, No. 2, October 1975.

The essence of the approach adopted here is that in each period the officer faces a gamble in which each possible outcome is a certainty equivalent of future single-period gambles.

THE DYNAMIC RETIREMENT DECISION MODEL WITH RISK AVERSION

As before, let P_{ijt} be the probability of moving from state i to state j at completion of t years of service. P_{ijt} has not been multiplied by the survival probability $s_{t,t+1}$, however. Let $R_{t\ell}(i)$ be the present value of the retirement annuity for the individual who retires from state i upon completing t years of service and lives exactly ℓ-t years beyond retirement from the military. In addition, assume that the retired officer receives civilian wage income of w_{ik}, where i and k denote, respectively, rank at retirement and the year of service equivalent of his age. For ages greater than sixty-five, $w_{ik} = 0$. We assume that civilian wages are log normally distributed random variables with the following stochastic structure:

$$\ell n\, w_{ik} = \mu_{ik} + v_k$$

$$v_k = \gamma v_{k-1} + \varepsilon_k$$

$$\varepsilon_k \sim N(0,\sigma_\varepsilon^2)$$

Hence, we have assumed that officers do not know the exact values of their potential civilian age-dependent earnings. However, they do know the probability distributions of these earnings. The present discounted value of these civilian wages if the individual lives ℓ-k years beyond military retirement is

$$C_{t\ell}(i) = \sum_{k=t+1}^{\ell} \beta^{k-t} w_{ik}$$

so that their (conditional on ℓ) expected utility is

$$E\{u(C_{t\ell}(i))\} = -\int^{\infty} e^{-\lambda c} dF_{t\ell}(c) ,$$

where F is the cumulative distribution function of C.*

Therefore, the expected utility derived from leaving the Air Force is

$$U_t(i) = \sum_{\ell=t+1}^{\infty} [(1-s_{\ell,\ell+1})\, s_{t\ell}]\, E\{u(C_{t\ell}(i)\}\, e^{-\lambda R_{t\ell}(i)} \qquad (7)$$

The term in brackets in (7) is the probability of living from t to ℓ and dying at $\ell+1$. $U_t(i)$ is then the probability weighted average of the expected utilities of civilian returns, including retirement pay, for each possible future lifetime.

If the officer chooses to remain in the Air Force, he moves according to transition probability P_{ijt} from state i to state j in the next period. If $j \leq 26$, i.e., he is not involuntarily separated or retired from the Air Force, then he receives the single-period compensation $m_{j,t+1}$ and again chooses whether to remain or leave and receives the optimal return of $V_{t+1}(j)$. The exact value of j is unknown, but we can calculate the discounted expected utility of the stay decision. It is given by:

$$\sum_{j=i}^{26} s_{t,t+1} P_{ijt} e^{-\lambda m_{j,t+1}} V^{\beta}_{t+1}(j) \qquad (8)$$

If there is a nonzero probability that the officer will be terminated even if he desires to remain, the return associated with becoming a civilian must be added to (8) and the expected discounted utility of staying is:

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*Since the wage incomes are serially correlated and not identically distributed, the weighted sum of these random variables does not have an analytic distribution. The mean and variance of the sum can be calculated and we have assumed that the distribution of the sum can be approximated by a gamma distribution.

$$- \sum_{j=i}^{26} s_{t,t+1} P_{ijt} e^{-\lambda\beta m_{j,t+1}} V_{t+1}^{\beta}(j) + P_{i,27,t} U_t(i) e^{-\lambda\beta x_{it}} . \qquad (9)$$

where x_{it} is any severence pay that accompanies involuntary separation. Expression (9) is the return, measured according to the assumed utility function, from choosing to remain in the Air Force at least one more year and behaving optimally for the remaining periods.

The optimal decision at t, stay or leave, is obtained by choosing the maximum of (7) and (9). As before, this can be represented by the functional equation:

$$V_t(i) = \max [(7), (9)] . \qquad (10)$$

NUMERICAL RESULTS

The stay/leave decisions resulting from the numerical analysis of the functional equation (10) were predictably different from those of the functional equation displaying risk neutrality. The results of the analysis of (10) do not greatly alter conclusions obtained in the risk neutral case and therefore we will summarize the results below rather than displaying the many tables generated.

Three different values of λ were evaluated: 0.0, 0.0002, and 0.0007. Clearly, when λ is very small this is the same as the risk neutral utility function.* Values for γ and σ_ε^2 were drawn from estimates by Lillard and Willis.** γ was set equal to 0.35 and σ_ε^2 equal to 0.072. The sensitivity of the results to variations in these parameters was not examined.

Due to numerical problems in the computation of the dynamic programs, restrictions had to be placed on the survival probabilities. Specifically, it was assumed that survival to age seventy is certain with no financial

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*$-e^{-\lambda x}$ is asymptotically linear in x as λ approaches zero.

**Lee Lillard and Robert Willis, "Dynamic Aspects of Earning Mobility," Econometrica, Vol. 46, No. 5, Sept. 1978.

returns after that age. This assumption, when examined in the risk neutral setting, caused only slight changes in the results but the effects on the risk averse case are unknown.

In general, attachment to the Air Force increases with the degree of risk aversion. For each of the sensitivity analyses conducted--changing military pay, civilian pay, and the discount factor--increased risk aversion attenuates the incentive to retire. For example, increases in the discount rate, ρ, (decreases in the discount factor, β) induce earlier retirement in the risk neutral setting. We would expect this inducement to weaken as λ increases and this is exactly what occurs.

In each retirement system alternative examined, as λ increases so do the optimal retirement years of service. However, changes in λ do not influence the rank ordering of incentives to leave. If the base case contains a larger incentive to retire at twenty years of service than a particular alternative system in the risk neutral setting, then the same is true in the risk averse setting.

In the special case which we examined, i.e., restrictions on the survival probabilities, as the risk aversion parameters, λ, increased, the certainty equivalent values of the return from staying and the return from leaving diminished. The certainty equivalent costs of leaving, however, did not diminish in the same proportion. This is the phenomenon discussed above--that the attachment to the Air Force increases as λ increases. It also implies, however, that changes in the certainty equivalent costs of leaving induced by changes in the retirement system would be smaller as λ is larger. Remaining to be determined, of course, are the relationships between retention rates and the costs of leaving.

SUMMARY OF THE RISK AVERSE CASE

Under the assumption that the utility of wealth function has the exponential form, we have derived and numerically evaluated a dynamic program. As in the risk neutral setting, the numerical evaluations were conducted under the assumption of no change in promotion, mandatory separation, and mandatory retirement probabilities facing individuals.

There are subtle differences in responses to changing retirement systems between the risk neutral and risk averse cases. These differences

may imply different personnel policies required to satisfy grade tables under each retirement system. This is not an easy issue to resolve given the as yet unresolved technical issues in the temporal resolution of uncertainty.

VI. POLICY RELEVANCE AND FUTURE WORK

The features of optimal decisionmaking presented above carry an implication for the design and analysis of alternative retirement systems. While the retirement pay received by the officer who plans to retire in some given year of service may differ from one system to another, the officer may revise his plans in order to mitigate his financial loss or even achieve a gain. Clearly it is possible to design alternatives wherein officers' incentives are fundamentally changed yet without large impacts on the officers' optimal expected present values for careers. What must be specified is the force distribution to be achieved.

To design a retirement and compensation system that will achieve a given force distribution or to calculate the force distribution which will result from a given retirement and compensation system, retention rates are required. In our next report we will present a theory of behavior relating the costs of leaving to patterns of retention among individuals in the military. In that report we will also compare the types of predictions from the proposed theory to the predictions from simple logistic regression models currently used in the Department of Defense and elsewhere.

The final stage of our analysis of retirement decisions is to statistically relate empirical retention patterns to costs of leaving for the groups in our sample, covering more than ten calendar years, three aeronautical ratings, and two sources of commission (Academy and non-Academy). Having achieved this, the resulting statistical retirement models will be integrated with manpower models to allow a full system evaluation of the impacts of alternative retirement systems on the personnel policies, structure, and cost of the Air Force officer force.

Appendix

Table 2

PROPORTIONAL CHANGES IN ANNUAL CIVILIAN EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
				CAPTAIN			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
7	137	138	140	142	144	147	149
	62	52	43	34	26	18	9
				MAJOR			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
12	147	149	152	155	158	162	167
	71	62	53	45	38	31	24
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
13	149	152	154	157	161	166	170
	73	64	56	48	41	34	28
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
14	151	154	157	160	165	170	175
	75	66	58	51	44	38	32
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
15	153	156	159	163	168	173	178
	76	68	61	54	48	42	37
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
16	155	158	161	165	171	177	183
	78	71	63	57	51	46	42
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
17	138	144	150	157	164	172	180
	62	57	52	49	45	42	39
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
18	135	142	149	157	166	174	183
	60	56	52	50	48	45	43
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
19	134	141	149	158	168	177	187
	59	56	53	52	51	50	49
	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE	LEAVE
20	133	141	150	160	171	181	192
	4	2	0	-1	-2	-3	-4
	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE	LEAVE
21	132	141	151	161	172	182	193
	2	1	0	-1	-2	-3	-5
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
22	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	131	142	152	162	173	183	193

Table 2 (CONT.)

PROPORTIONAL CHANGES IN ANNUAL CIVILIAN EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS .7	.8	.9	1.0	1.1	1.2	1.3
				LIEUTENANT COLONEL			
	STAY	STAY	STAY	STAY	STAY	STAY	S/L
20	161	165	170	175	183	191	200
	24	18	12	7	4	2	0
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
21	161	165	170	176	184	193	203
	22	16	11	6	4	3	2
	STAY	STAY	STAY	STAY	STAY	S/L	LEAVE
22	158	163	168	175	184	194	204
	15	10	5	2	1	0	-1
	STAY	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE
23	156	161	167	175	185	195	205
	12	7	3	0	-1	-2	-3
	STAY	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE
24	154	161	167	175	185	195	205
	9	5	2	0	-1	-2	-3
	STAY	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE
25	153	160	167	176	186	196	206
	6	3	1	0	-2	-3	-4
	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE	LEAVE
26	152	159	167	177	186	196	206
	4	2	0	-1	-2	-3	-4
	STAY	S/L	LEAVE	LEAVE	LEAVE	LEAVE	LEAVE
27	151	159	168	177	187	196	205
	1	0	-1	-2	-3	-4	-5
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	149	159	168	177	186	196	205

Table 2 (CONT.)

PROPORTIONAL CHANGES IN ANNUAL CIVILIAN EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
	COLONEL						
22	STAY 180 18	STAY 185 10	STAY 191 5	S/L 199 0	LEAVE 210 -2	LEAVE 222 -3	LEAVE 234 -4
23	STAY 180 16	STAY 185 9	STAY 193 5	STAY 201 1	LEAVE 211 -2	LEAVE 223 -4	LEAVE 235 -5
24	STAY 180 15	STAY 186 9	STAY 194 5	STAY 203 3	S/L 212 0	LEAVE 224 -2	LEAVE 235 -5
25	STAY 181 13	STAY 187 8	STAY 196 6	STAY 206 4	STAY 216 3	STAY 226 2	STAY 236 1
26	STAY 181 6	STAY 188 2	S/L 198 0	LEAVE 209 -2	LEAVE 220 -3	LEAVE 231 -4	LEAVE 243 -5
27	STAY 180 4	STAY 188 1	LEAVE 198 -1	LEAVE 209 -2	LEAVE 220 -3	LEAVE 231 -5	LEAVE 242 -6
28	STAY 180 2	S/L 188 0	LEAVE 199 -1	LEAVE 210 -2	LEAVE 220 -4	LEAVE 231 -5	LEAVE 242 -6
29	STAY 179 1	S/L 189 0	LEAVE 199 -2	LEAVE 209 -3	LEAVE 220 -4	LEAVE 230 -5	LEAVE 241 -7
30	MAND. RETIRE. 178	MAND. RETIRE. 189	MAND. RETIRE. 199	MAND. RETIRE. 209	MAND. RETIRE. 219	MAND. RETIRE. 229	MAND. RETIRE. 239

Table 3

PROPORTIONAL CHANGES IN ANNUAL MILITARY EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
			CAPTAIN		
	STAY	STAY	STAY	STAY	STAY
7	118	130	142	154	167
	10	22	34	47	59
			MAJOR		
	STAY	STAY	STAY	STAY	STAY
12	131	143	155	168	181
	21	33	45	58	71
	STAY	STAY	STAY	STAY	STAY
13	133	145	157	170	184
	24	36	48	61	74
	STAY	STAY	STAY	STAY	STAY
14	137	148	160	173	187
	27	39	51	64	77
	STAY	STAY	STAY	STAY	STAY
15	139	151	163	176	189
	30	42	54	66	80
	STAY	STAY	STAY	STAY	STAY
16	142	154	165	178	192
	34	45	57	70	83
	STAY	STAY	STAY	STAY	STAY
17	139	148	157	166	176
	31	40	49	58	68
	STAY	STAY	STAY	STAY	STAY
18	141	149	157	165	174
	34	42	50	58	67
	STAY	STAY	STAY	STAY	STAY
19	144	151	158	166	174
	37	45	52	59	68
	LEAVE	LEAVE	LEAVE	S/L	STAY
20	147	154	160	167	175
	-3	-2	-1	0	1
	LEAVE	LEAVE	LEAVE	S/L	STAY
21	148	155	161	168	176
	-3	-2	-1	0	1
	MAND.	MAND.	MAND.	MAND.	MAND.
22	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	148	155	162	169	177

Table 3 (CONT.)

PROPORTIONAL CHANGES IN ANNUAL MILITARY EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS				
	.8	.9	1.0	1.1	1.2
	LIEUTENANT COLONEL				
	STAY	STAY	STAY	STAY	STAY
20	154	164	175	188	201
	1	4	7	12	18
	STAY	STAY	STAY	STAY	STAY
21	156	166	176	188	201
	2	4	6	11	16
	LEAVE	STAY	STAY	STAY	STAY
22	157	166	175	187	199
	-1	1	2	5	9
	LEAVE	LEAVE	S/L	STAY	STAY
23	157	166	175	186	198
	-2	-1	0	3	6
	LEAVE	LEAVE	S/L	STAY	STAY
24	158	167	175	186	197
	-2	-1	0	2	4
	LEAVE	LEAVE	S/L	STAY	STAY
25	158	167	176	186	197
	-2	-1	0	1	2
	LEAVE	LEAVE	LEAVE	S/L	STAY
26	158	167	177	186	197
	-3	-2	-1	0	1
	LEAVE	LEAVE	LEAVE	LEAVE	S/L
27	158	167	177	187	196
	-3	-3	-2	-1	0
	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	157	167	177	187	197

Table 3 (CONT.)

PROPORTIONAL CHANGES IN ANNUAL MILITARY EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS				
	.8	.9	1.0	1.1	1.2
			COLONEL		
	LEAVE	LEAVE	S/L	STAY	STAY
22	180	189	199	212	226
	-3	-2	0	5	9
	LEAVE	LEAVE	STAY	STAY	STAY
23	181	190	201	214	227
	-3	-2	1	5	8
	LEAVE	S/L	STAY	STAY	STAY
24	181	191	203	216	229
	-2	0	3	5	8
	STAY	STAY	STAY	STAY	STAY
25	182	194	206	218	230
	1	3	4	6	8
	LEAVE	LEAVE	LEAVE	LEAVE	S/L
26	187	198	209	220	232
	-4	-3	-2	-1	0
	LEAVE	LEAVE	LEAVE	LEAVE	S/L
27	186	198	209	221	232
	-4	-3	-2	-1	0
	LEAVE	LEAVE	LEAVE	LEAVE	LEAVE
28	186	198	210	221	233
	-4	-3	-2	-1	-1
	LEAVE	LEAVE	LEAVE	LEAVE	LEAVE
29	185	197	209	222	234
	-5	-4	-3	-2	-1
	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	184	197	209	221	234

Table 4

CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	CAPTAIN				
	STAY	STAY	STAY	STAY	STAY
7	272	190	142	111	91
	86	52	34	24	13
	MAJOR				
	STAY	STAY	STAY	STAY	STAY
12	281	202	155	124	102
	109	65	45	34	26
	STAY	STAY	STAY	STAY	STAY
13	281	205	157	126	104
	103	68	48	36	28
	STAY	STAY	STAY	STAY	STAY
14	283	207	160	129	107
	106	71	51	39	30
	STAY	STAY	STAY	STAY	STAY
15	283	209	163	132	109
	109	74	54	41	33
	STAY	STAY	STAY	STAY	STAY
16	284	212	165	134	112
	112	77	57	44	35
	STAY	STAY	STAY	STAY	STAY
17	259	197	157	129	108
	90	64	49	38	31
	STAY	STAY	STAY	STAY	STAY
18	255	196	157	130	110
	89	64	50	40	33
	STAY	STAY	STAY	STAY	STAY
19	252	196	158	132	112
	90	66	52	42	35
	STAY	S/L	LEAVE	LEAVE	LEAVE
20	251	197	160	134	115
	1	0	-1	-1	-2
	S/L	LEAVE	LEAVE	LEAVE	LEAVE
21	250	197	161	135	116
	0	-1	-1	-2	-2
	MAND.	MAND.	MAND.	MAND.	MAND.
22	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	249	198	162	137	117

Table 4 (CONT.)

CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	LIEUTENANT COLONEL				
	STAY	STAY	STAY	STAY	STAY
20	287	219	175	145	123
	24	13	7	4	3
	STAY	STAY	STAY	STAY	STAY
21	284	219	176	146	125
	21	11	6	4	3
	STAY	STAY	STAY	STAY	S/L
22	278	217	175	146	125
	11	5	2	1	0
	STAY	STAY	S/L	S/L	LEAVE
23	274	214	175	147	126
	7	2	0	0	-1
	STAY	STAY	S/L	LEAVE	LEAVE
24	271	214	175	148	128
	5	1	0	-1	-1
	STAY	S/L	S/L	LEAVE	LEAVE
25	267	213	176	149	129
	3	0	0	-1	-1
	STAY	S/L	LEAVE	LEAVE	LEAVE
26	264	213	177	150	130
	1	0	-1	-1	-2
	S/L	LEAVE	LEAVE	LEAVE	LEAVE
27	261	212	177	151	131
	0	-1	-2	-2	-2
	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	259	211	177	152	132

Table 4 (CONT.)

CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
			COLONEL		
22	STAY 317 12	STAY 247 5	S/L 199 0	LEAVE 167 -1	LEAVE 143 -2
23	STAY 316 11	STAY 248 5	STAY 201 1	LEAVE 168 -1	LEAVE 145 -2
24	STAY 314 11	STAY 249 6	STAY 203 3	STAY 170 1	LEAVE 146 -1
25	STAY 313 11	STAY 250 7	STAY 206 4	STAY 174 3	STAY 149 2
26	S/L 312 0	LEAVE 251 -1	LEAVE 209 -2	LEAVE 178 -2	LEAVE 154 -2
27	S/L 309 0	LEAVE 251 -1	LEAVE 209 -2	LEAVE 179 -2	LEAVE 155 -3
28	LEAVE 306 -1	LEAVE 250 -2	LEAVE 210 -2	LEAVE 179 -3	LEAVE 156 -3
29	LEAVE 303 -1	LEAVE 249 -2	LEAVE 209 -3	LEAVE 180 -3	LEAVE 157 -4
30	MAND. RETIRE. 299	MAND. RETIRE. 247	MAND. RETIRE. 209	MAND. RETIRE. 180	MAND. RETIRE. 158

Table 5

RETIREMENT MODERNIZATION ACT
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	BASE CASE	RMA
	CAPTAIN	
	STAY	STAY
7	142	141
	34	33
	MAJOR	
	STAY	STAY
12	155	153
	45	42
	STAY	STAY
13	157	156
	48	44
	STAY	STAY
14	160	158
	51	46
	STAY	STAY
15	163	161
	54	49
	STAY	STAY
16	165	163
	57	51
	STAY	STAY
17	157	150
	49	38
	STAY	STAY
18	157	149
	50	37
	STAY	STAY
19	158	149
	52	37
	LEAVE	STAY
20	160	150
	-1	1
	LEAVE	S/L
21	161	152
	-1	0
	MAND.	MAND.
22	RETIRE.	RETIRE.
	162	153

Table 5 (CONT.)

RETIREMENT MODERNIZATION ACT
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	BASE CASE	RMA	BASE CASE	RMA
	LIEUTENANT COLONEL		COLONEL	
20	STAY 175 7	STAY 173 17		
21	STAY 176 6	STAY 174 16		
22	STAY 175 2	STAY 172 10	S/L 199 0	STAY 196 10
23	S/L 175 0	STAY 172 8	STAY 201 1	STAY 198 9
24	S/L 175 0	STAY 172 6	STAY 203 3	STAY 200 9
25	S/L 176 0	STAY 173 4	STAY 206 4	STAY 202 9
26	LEAVE 177 -1	STAY 173 2	LEAVE 209 -2	STAY 205 2
27	LEAVE 177 -2	S/L 174 0	LEAVE 209 -2	STAY 206 1
28	MAND. RETIRE. 177	MAND. RETIRE. 176	LEAVE 210 -2	S/L 208 0
29			LEAVE 209 -3	S/L 211 0
30			MAND. RETIRE. 209	MAND. RETIRE. 213

Table 6

PROPORTIONAL CHANGES IN ANNUAL CIVILIAN EARNINGS UNDER THE RMA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
				CAPTAIN			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
7	137	138	139	141	142	144	146
	62	52	43	33	24	15	7
				MAJOR			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
12	147	149	151	153	156	158	162
	69	60	51	42	33	25	18
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
13	149	151	153	156	158	161	166
	70	61	53	44	36	28	21
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
14	151	153	156	158	161	165	169
	72	63	55	46	38	31	25
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
15	152	155	158	161	164	168	173
	73	65	57	49	41	34	28
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
16	154	157	160	163	167	171	176
	74	66	59	51	44	37	32
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
17	133	139	144	150	157	164	172
	53	48	43	38	34	30	27
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
18	129	136	143	149	157	165	174
	49	45	41	37	34	31	29
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
19	127	134	142	149	158	167	177
	46	43	40	37	35	34	33
	STAY	STAY	STAY	STAY	S/L	LEAVE	LEAVE
20	125	133	142	150	160	170	181
	7	5	3	1	0	-1	-3
	STAY	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE
21	124	133	142	152	162	172	182
	4	3	1	0	-1	-2	-3
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
22	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	122	132	143	153	163	173	184

Table 6 (CONT.)

PROPORTIONAL CHANGES IN ANNUAL CIVILIAN EARNINGS UNDER THE RMA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
				LIEUTENANT COLONEL			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
20	161	165	169	173	178	183	191
	37	30	24	17	11	6	4
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
21	160	165	169	174	179	185	193
	34	28	22	16	10	6	4
	STAY	STAY	STAY	STAY	STAY	STAY	S/L
22	157	162	167	172	178	184	193
	26	21	16	10	6	2	0
	STAY	STAY	STAY	STAY	STAY	S/L	LEAVE
23	155	161	166	172	178	185	195
	21	17	12	8	3	0	-1
	STAY	STAY	STAY	STAY	STAY	S/L	LEAVE
24	154	160	166	172	179	187	196
	17	14	10	6	3	0	-1
	STAY	STAY	STAY	STAY	STAY	S/L	LEAVE
25	152	159	166	173	180	189	198
	13	10	7	4	1	0	-1
	STAY	STAY	STAY	STAY	STAY	LEAVE	LEAVE
26	151	158	166	173	182	191	200
	8	6	4	2	1	-1	-2
	STAY	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE
27	149	157	166	174	183	193	202
	4	3	2	0	-1	-2	-3
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	148	157	167	176	185	194	204

Table 6 (CONT.)

PROPORTIONAL CHANGES IN ANNUAL CIVILIAN EARNINGS UNDER THE RMA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
				COLONEL			
	STAY	STAY	STAY	STAY	STAY	S/L	LEAVE
22	182	187	191	196	202	210	221
	32	25	17	10	4	)	-2
	STAY	STAY	STAY	STAY	STAY	STAY	LEAVE
23	182	187	192	198	204	213	223
	30	23	16	9	4	1	-3
	STAY	STAY	STAY	STAY	STAY	STAY	S/L
24	183	188	194	200	207	216	225
	27	21	15	9	5	3	0
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
25	183	189	196	202	210	220	230
	24	19	14	9	5	4	3
	STAY	STAY	STAY	STAY	S/L	LEAVE	LEAVE
26	184	191	198	205	214	225	236
	15	11	6	2	0	-1	-3
	STAY	STAY	STAY	STAY	LEAVE	LEAVE	LEAVE
27	184	191	199	206	216	227	238
	11	8	4	1	-1	-2	-3
	STAY	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE
28	183	192	200	208	219	230	240
	7	5	2	0	-1	-2	-4
	STAY	STAY	STAY	S/L	LEAVE	LEAVE	LEAVE
29	183	192	201	211	221	232	242
	4	2	1	0	-1	-3	-4
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	183	193	203	213	223	234	244

Table 7

PROPORTIONAL CHANGES IN ANNUAL MILITARY EARNINGS UNDER THE BRA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS				
	.8	.9	1.0	1.1	1.2
			CAPTAIN		
	STAY	STAY	STAY	STAY	STAY
7	116	128	141	154	167
	8	20	33	46	59
			MAJOR		
	STAY	STAY	STAY	STAY	STAY
12	127	140	153	167	180
	17	29	42	55	69
	STAY	STAY	STAY	STAY	STAY
13	130	142	156	169	183
	19	31	44	57	71
	STAY	STAY	STAY	STAY	STAY
14	133	145	158	172	186
	21	33	46	60	73
	STAY	STAY	STAY	STAY	STAY
15	135	147	161	174	188
	24	36	49	62	75
	STAY	STAY	STAY	STAY	STAY
16	138	150	163	177	191
	26	38	51	64	77
	STAY	STAY	STAY	STAY	STAY
17	133	141	150	160	170
	22	29	38	47	56
	STAY	STAY	STAY	STAY	STAY
18	134	141	149	158	167
	23	29	37	45	53
	STAY	STAY	STAY	STAY	STAY
19	136	142	149	157	166
	25	31	37	44	52
	LEAVE	S/L	STAY	STAY	STAY
20	139	144	150	158	165
	-2	0	1	3	5
	LEAVE	LEAVE	S/L	STAY	STAY
21	140	146	152	158	165
	-2	-1	0	2	3
	MAND.	MAND.	MAND.	MAND.	MAND.
22	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	141	147	153	159	165

Table 7 (CONT.)

PROPORTIONAL CHANGES IN ANNUAL MILITARY EARNINGS UNDER THE RMA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
			LIEUTENANT COLONEL		
	STAY	STAY	STAY	STAY	STAY
20	148	160	173	187	201
	4	10	17	25	33
	STAY	STAY	STAY	STAY	STAY
21	149	161	174	187	201
	4	9	16	23	30
	STAY	STAY	STAY	STAY	STAY
22	149	160	172	185	199
	1	5	10	17	23
	S/L	STAY	STAY	STAY	STAY
23	150	160	172	184	197
	0	3	8	13	18
	S/L	STAY	STAY	STAY	STAY
24	151	161	172	184	196
	0	2	6	10	14
	S/L	STAY	STAY	STAY	STAY
25	152	162	173	184	196
	0	1	4	7	10
	LEAVE	S/L	STAY	STAY	STAY
26	154	163	173	184	195
	-1	0	2	4	6
	LEAVE	LEAVE	S/L	STAY	STAY
27	155	164	174	185	195
	-2	-1	0	2	3
	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	156	166	176	186	195

Table 7 (CONT.)

PROPORTIONAL CHANGES IN ANNUAL MILITARY EARNINGS UNDER THE RMA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS				
	.8	.9	1.0	1.1	1.2
			COLONEL		
	LEAVE	STAY	STAY	STAY	STAY
22	170	181	196	211	227
	-1	4	10	18	26
	S/L	STAY	STAY	STAY	STAY
23	172	184	198	213	229
	0	4	9	17	24
	STAY	STAY	STAY	STAY	STAY
24	174	186	200	215	230
	1	4	9	16	22
	STAY	STAY	STAY	STAY	STAY
25	178	189	202	217	232
	3	5	9	14	20
	LEAVE	S/L	STAY	STAY	STAY
26	182	192	205	219	234
	-1	0	2	6	11
	LEAVE	LEAVE	STAY	STAY	STAY
27	183	194	206	220	235
	-2	-1	1	4	8
	LEAVE	LEAVE	S/L	STAY	STAY
28	185	196	208	222	236
	-2	-1	0	2	5
	LEAVE	LEAVE	S/L	STAY	STAY
29	186	199	211	224	237
	-3	-1	0	1	2
	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	188	200	213	226	239

Table 8

CHANGES IN THE DISCOUNT FACTOR UNDER THE RMA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	CAPTAIN				
7	STAY 272	STAY 189	STAY 141	STAY 110	STAY 90
	86	51	33	23	17
	MAJOR				
12	STAY 279	STAY 201	STAY 153	STAY 122	STAY 100
	91	60	42	31	24
13	STAY 281	STAY 203	STAY 156	STAY 124	STAY 103
	93	62	44	33	26
14	STAY 282	STAY 206	STAY 158	STAY 127	STAY 105
	95	64	46	35	28
15	STAY 283	STAY 208	STAY 161	STAY 129	STAY 107
	96	66	49	37	30
16	STAY 283	STAY 210	STAY 163	STAY 132	STAY 110
	97	68	51	40	32
17	STAY 251	STAY 190	STAY 150	STAY 123	STAY 103
	65	49	38	30	25
18	STAY 246	STAY 188	STAY 149	STAY 122	STAY 103
	61	47	37	30	25
19	STAY 243	STAY 187	STAY 149	STAY 123	STAY 104
	59	46	37	30	26
20	STAY 241	STAY 187	STAY 150	S/L 124	S/L 106
	4	2	1	0	0
21	STAY 239	STAY 187	S/L 152	S/L 126	S/L 107
	2	1	0	0	0
22	MAND. RETIRE. 238	MAND. RETIRE. 187	MAND. RETIRE. 153	MAND. RETIRE. 128	MAND. RETIRE. 109

Table 8 (CONT.)

CHANGES IN THE DISCOUNT FACTOR UNDER THE RMA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	COLONEL				
	STAY	STAY	STAY	STAY	STAY
22	321	246	196	161	136
	30	18	10	6	3
	STAY	STAY	STAY	STAY	STAY
23	319	247	198	163	138
	28	16	9	6	3
	STAY	STAY	STAY	STAY	STAY
24	318	248	200	166	141
	26	16	9	6	4
	STAY	STAY	STAY	STAY	STAY
25	317	249	202	169	144
	24	14	9	6	4
	STAY	STAY	STAY	STAY	S/L
26	315	250	205	172	148
	11	5	2	1	0
	STAY	STAY	STAY	S/L	S/L
27	313	250	206	175	151
	7	3	1	0	0
	STAY	STAY	S/L	S/L	LEAVE
28	311	251	208	178	154
	4	2	0	0	-1
	STAY	STAY	S/L	LEAVE	LEAVE
29	309	251	211	181	158
	2	1	0	-1	-1
	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	306	252	213	184	161

Table 8 (CONT.)

CHANGES IN THE DISCOUNT FACTOR UNDER THE RMA
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	LIEUTENANT COLONEL				
	STAY	STAY	STAY	STAY	STAY
20	287	218	173	141	119
	40	26	17	12	9
	STAY	STAY	STAY	STAY	STAY
21	285	218	174	142	120
	36	23	16	11	8
	STAY	STAY	STAY	STAY	STAY
22	279	215	172	142	120
	25	16	10	7	5
	STAY	STAY	STAY	STAY	STAY
23	274	213	172	142	121
	19	12	8	5	3
	STAY	STAY	STAY	STAY	STAY
24	271	212	172	143	122
	15	10	6	4	2
	STAY	STAY	STAY	STAY	STAY
25	267	211	173	144	124
	11	7	4	2	1
	STAY	STAY	STAY	STAY	S/L
26	264	211	173	146	126
	7	4	2	1	0
	STAY	STAY	S/L	S/L	S/L
27	261	210	174	148	128
	2	1	0	0	0
	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	258	210	176	150	130

Table 9

PRESIDENT'S COMMISSION I
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	BASE CASE	PRES COMM I
	CAPTAIN	
7	STAY 142 34	STAY 143 35
	MAJOR	
12	STAY 155 45	STAY 156 32
13	STAY 157 48	STAY 159 32
14	STAY 160 51	STAY 162 32
15	STAY 163 54	STAY 165 32
16	STAY 165 57	STAY 167 32
17	STAY 157 49	STAY 155 16
18	STAY 157 50	STAY 154 13
19	STAY 158 52	STAY 155 11
20	LEAVE 160 -1	STAY 156 8
21	LEAVE 161 -1	STAY 158 8
22	MAND. RETIRE. 162	MAND. RETIRE. 160

Table 9 (CONT.)

PRESIDENT'S COMMISSION I
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	BASE CASE	PRES COMM I	BASE CASE	PRES COMM I
	LIEUTENANT COLONEL		COLONEL	
20	STAY 175 7	STAY 179 28		
21	STAY 176 6	STAY 180 27		
22	STAY 175 2	STAY 178 22	S/L 199 0	STAY 213 39
23	S/L 175 0	STAY 177 18	STAY 201 1	STAY 217 40
24	S/L 175 0	STAY 177 16	STAY 203 3	STAY 221 41
25	S/L 176 0	STAY 178 14	STAY 206 4	STAY 225 42
26	LEAVE 177 -1	STAY 179 13	LEAVE 209 -2	STAY 230 45
27	LEAVE 177 -2	STAY 180 12	LEAVE 209 -2	STAY 235 47
28	MAND. RETIRE. 177	MAND. RETIRE. 182	LEAVE 210 -2	STAY 240 49
29			LEAVE 209 -3	STAY 245 52
30			MAND. RETIRE. 209	MAND. RETIRE. 252

Table 10

PRESIDENT'S COMMISSION I - CHANGES IN ANNUAL CIVILIAN EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
				CAPTAIN			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
7	139	140	141	143	144	145	147
	64	54	45	35	26	16	7
				MAJOR			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
12	150	152	154	156	158	160	162
	58	50	41	32	23	14	5
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
13	152	154	157	159	161	164	166
	58	49	40	32	23	14	6
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
14	154	157	159	162	165	167	170
	57	49	40	32	23	15	7
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
15	156	159	162	165	167	170	173
	56	48	40	32	23	15	7
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
16	158	161	164	167	170	174	177
	55	47	39	32	24	16	8
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
17	137	143	149	155	160	166	172
	31	26	21	16	11	6	1
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
18	134	141	147	154	161	168	174
	25	21	17	13	9	5	1
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
19	132	140	147	155	163	170	178
	20	17	14	11	8	5	2
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
20	131	140	148	156	165	173	182
	14	12	10	8	6	3	1
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
21	130	140	149	158	168	177	186
	11	10	9	8	7	5	4
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
22	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	129	140	150	160	171	181	191

Table 10 (CONT.)

PRESIDENT'S COMMISSION I - CHANGES IN ANNUAL CIVILIAN EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS .7	.8	.9	1.0	1.1	1.2	1.3
				LIEUTENANT COLONEL			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
20	167	171	175	179	183	187	191
	48	41	35	28	22	15	9
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
21	166	171	175	180	184	189	193
	44	38	33	27	21	15	9
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
22	163	168	173	178	183	188	193
	38	33	27	22	17	11	6
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
23	160	166	171	177	182	188	193
	32	28	23	18	14	9	4
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
24	159	165	171	177	184	190	196
	28	24	20	16	12	8	5
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
25	158	164	171	178	185	192	198
	23	20	17	14	11	8	5
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
26	156	164	171	179	186	194	201
	19	17	15	13	11	9	7
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
27	154	163	171	180	188	196	205
	15	14	13	12	11	10	9
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	154	163	173	182	191	200	210

Table 10 (CONT.)

PRESIDENT'S COMMISSION I - CHANGES IN ANNUAL CIVILIAN EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS .7	.8	.9	1.0	1.1	1.2	1.3
				COLONEL			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
22	199	204	208	213	217	222	227
	62	54	47	39	32	25	17
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
23	201	206	211	217	222	227	232
	60	53	47	40	33	26	20
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
24	204	209	215	221	226	232	237
	59	53	47	41	35	29	23
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
25	207	213	219	225	231	237	243
	58	53	47	42	37	32	26
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
26	210	217	223	230	237	244	250
	58	54	49	45	41	36	32
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
27	212	220	227	235	242	250	257
	57	54	50	47	43	40	36
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
28	215	223	231	240	248	256	265
	56	54	51	49	46	44	42
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
29	218	227	236	245	255	264	273
	56	54	53	52	50	49	48
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	221	232	242	252	262	272	282

Table 11

PRESIDENT'S COMMISSION I - CHANGES IN ANNUAL MILITARY EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
			CAPTAIN		
	STAY	STAY	STAY	STAY	STAY
7	116	130	143	156	169
	9	22	35	48	62
			MAJOR		
	STAY	STAY	STAY	STAY	STAY
12	128	142	156	170	184
	8	20	32	44	56
	STAY	STAY	STAY	STAY	STAY
13	131	145	159	173	187
	8	20	32	43	55
	STAY	STAY	STAY	STAY	STAY
14	134	148	162	176	190
	9	20	32	43	55
	STAY	STAY	STAY	STAY	STAY
15	136	150	165	179	193
	9	20	32	43	54
	STAY	STAY	STAY	STAY	STAY
16	139	153	167	182	196
	10	21	32	42	53
	STAY	STAY	STAY	STAY	STAY
17	134	144	155	165	175
	3	9	16	23	29
	STAY	STAY	STAY	STAY	STAY
18	135	145	154	164	173
	2	7	13	18	23
	STAY	STAY	STAY	STAY	STAY
19	137	146	155	164	172
	2	7	11	15	19
	STAY	STAY	STAY	STAY	STAY
20	140	148	156	165	173
	2	5	8	11	14
	STAY	STAY	STAY	STAY	STAY
21	143	151	158	166	173
	4	6	8	10	12
	MAND.	MAND.	MAND.	MAND.	MAND.
22	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	147	153	160	167	174

Table 11 (CONT.)

PRESIDENT'S COMMISSION I - CHANGES IN ANNUAL MILITARY EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
			LIEUTENANT COLONEL		
	STAY	STAY	STAY	STAY	STAY
20	150	164	179	194	208
	10	19	28	37	47
	STAY	STAY	STAY	STAY	STAY
21	151	165	180	194	209
	10	18	27	35	44
	STAY	STAY	STAY	STAY	STAY
22	150	164	178	192	205
	7	15	22	30	37
	STAY	STAY	STAY	STAY	STAY
23	150	164	177	190	203
	6	12	18	25	31
	STAY	STAY	STAY	STAY	STAY
24	152	165	177	190	203
	5	11	16	22	27
	STAY	STAY	STAY	STAY	STAY
25	153	166	178	190	202
	5	10	14	18	23
	STAY	STAY	STAY	STAY	STAY
26	155	167	179	190	202
	6	10	13	17	20
	STAY	STAY	STAY	STAY	STAY
27	157	168	180	191	202
	7	10	12	14	17
	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	161	171	182	192	203

Table 11 (CONT.)

PRESIDENT'S COMMISSION I - CHANGES IN ANNUAL MILITARY EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
			COLONEL		
	STAY	STAY	STAY	STAY	STAY
22	177	195	213	231	249
	17	28	39	51	62
	STAY	STAY	STAY	STAY	STAY
23	181	199	217	234	252
	18	29	40	51	61
	STAY	STAY	STAY	STAY	STAY
24	185	203	221	238	256
	20	30	41	51	61
	STAY	STAY	STAY	STAY	STAY
25	189	207	225	243	261
	23	33	42	52	62
	STAY	STAY	STAY	STAY	STAY
26	194	212	230	248	266
	27	36	45	54	63
	STAY	STAY	STAY	STAY	STAY
27	199	217	235	252	270
	30	38	47	55	64
	STAY	STAY	STAY	STAY	STAY
28	204	222	240	257	275
	33	41	49	57	64
	STAY	STAY	STAY	STAY	STAY
29	210	228	245	263	281
	37	45	52	59	66
	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	217	234	252	269	287

Table 12

PRESIDENT'S COMMISSION I - CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	CAPTAIN				
	STAY	STAY	STAY	STAY	STAY
7	272	191	143	112	91
	86	53	35	25	18
	MAJOR				
	STAY	STAY	STAY	STAY	STAY
12	278	203	156	125	103
	78	49	32	21	13
	STAY	STAY	STAY	STAY	STAY
13	279	206	159	127	105
	77	49	32	20	13
	STAY	STAY	STAY	STAY	STAY
14	281	208	162	130	108
	77	49	32	20	13
	STAY	STAY	STAY	STAY	STAY
15	281	210	165	133	111
	75	48	32	20	12
	STAY	STAY	STAY	STAY	STAY
16	281	212	167	136	114
	73	48	32	20	12
	STAY	STAY	STAY	STAY	STAY
17	245	191	155	129	110
	35	24	16	10	6
	STAY	STAY	STAY	STAY	STAY
18	238	188	154	130	112
	27	19	13	8	5
	STAY	STAY	STAY	STAY	STAY
19	234	187	155	132	114
	21	15	11	7	4
	STAY	STAY	STAY	STAY	STAY
20	232	187	156	134	117
	13	10	8	6	4
	STAY	STAY	STAY	STAY	STAY
21	230	188	158	137	121
	11	9	8	6	5
	MAND.	MAND.	MAND.	MAND.	MAND.
22	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	228	188	160	140	125

Table 12 (CONT.)

PRESIDENT'S COMMISSION I - CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	LIEUTENANT COLONEL				
	STAY	STAY	STAY	STAY	STAY
20	286	222	179	148	125
	63	43	28	18	10
	STAY	STAY	STAY	STAY	STAY
21	282	222	180	149	127
	58	40	27	17	9
	STAY	STAY	STAY	STAY	STAY
22	273	217	178	149	128
	47	33	22	14	7
	STAY	STAY	STAY	STAY	STAY
23	266	214	177	149	129
	39	27	18	11	6
	STAY	STAY	STAY	STAY	STAY
24	262	212	177	151	131
	32	23	16	10	6
	STAY	STAY	STAY	STAY	STAY
25	257	211	178	153	134
	26	19	14	9	6
	STAY	STAY	STAY	STAY	STAY
26	253	210	179	155	137
	21	17	13	10	7
	STAY	STAY	STAY	STAY	STAY
27	248	208	180	158	141
	16	14	12	10	9
	MAND.	MAND.	MAND.	MAND.	MAND.
28	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	245	208	182	162	145

Table 12 (CONT.)

PRESIDENT'S COMMISSION I - CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	COLONEL				
22	STAY 337 85	STAY 264 58	STAY 213 39	STAY 176 26	STAY 148 15
23	STAY 337 91	STAY 266 57	STAY 217 40	STAY 180 27	STAY 152 16
24	STAY 337 79	STAY 269 57	STAY 221 41	STAY 185 28	STAY 157 18
25	STAY 336 77	STAY 272 57	STAY 225 42	STAY 190 30	STAY 163 21
26	STAY 336 76	STAY 275 58	STAY 230 45	STAY 196 34	STAY 170 25
27	STAY 335 73	STAY 277 58	STAY 235 47	STAY 202 37	STAY 176 29
28	STAY 334 70	STAY 280 58	STAY 240 49	STAY 209 41	STAY 184 34
29	STAY 333 68	STAY 283 59	STAY 245 52	STAY 216 45	STAY 193 40
30	MAND. RETIRE. 332	MAND. RETIRE. 286	MAND. RETIRE. 252	MAND. RETIRE. 225	MAND. RETIRE. 204

Table 13

PRESIDENT'S COMMISSION II
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PRES COMM I	PRES COMM II
	CAPTAIN	
	STAY	STAY
7	143	145
	35	37
	MAJOR	
	STAY	STAY
12	156	160
	32	35
	STAY	STAY
13	159	163
	32	36
	STAY	STAY
14	162	166
	32	36
	STAY	STAY
15	165	169
	32	36
	STAY	STAY
16	167	173
	32	37
	STAY	STAY
17	155	159
	16	21
	STAY	STAY
18	154	159
	13	17
	STAY	STAY
19	155	160
	11	16
	STAY	STAY
20	156	162
	8	13
	STAY	STAY
21	158	164
	3	14

COMPLETED YEARS OF SERVICE	PRES COMM I	PRES COMM II
	MAJOR	
22	MAND. RETIRE. 160	STAY 167 14
23		STAY 170 15
24		STAY 173 17
25		STAY 177 18
26		STAY 181 22
27		STAY 186 25
28		STAY 192 29
29		STAY 198 34
30		MAND. RETIRE. 205

Table 13 (CONT.)

PRESIDENT'S COMMISSION II
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PRES COMM I	PRES COMM II	PRES COMM I	PRES COMM II
	LIEUTENANT COLONEL		COLONEL	
	STAY	STAY		
20	179	187		
	28	37		
	STAY	STAY		
21	180	189		
	27	36		
	STAY	STAY	STAY	STAY
22	178	190	213	213
	22	34	39	39
	STAY	STAY	STAY	STAY
23	177	191	217	217
	18	33	40	40
	STAY	STAY	STAY	STAY
24	177	194	221	221
	16	33	41	41
	STAY	STAY	STAY	STAY
25	178	197	225	225
	14	33	42	42
	STAY	STAY	STAY	STAY
26	179	200	230	230
	13	34	45	45
	STAY	STAY	STAY	STAY
27	180	203	235	235
	12	36	47	47
	MAND.	STAY	STAY	STAY
28	RETIRE.	208	240	240
	182	39	49	49
		STAY	STAY	STAY
29		214	245	245
		42	52	52
		MAND.	MAND.	MAND.
30		RETIRE.	RETIRE.	RETIRE.
		220	252	252

Table 14

PRESIDENT'S COMMISSION II - CHANGES IN ANNUAL CIV EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
				CAPTAIN			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
7	142	143	144	145	146	147	148
	67	57	47	37	27	18	8
				MAJOR			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
12	155	157	158	160	161	163	165
	64	54	45	35	26	17	8
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
13	158	159	161	163	164	166	168
	63	54	45	36	26	17	8
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
14	161	163	164	166	168	170	172
	63	54	45	36	27	18	9
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
15	163	165	167	169	171	174	176
	63	54	45	36	27	19	10
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
16	166	168	170	173	175	177	180
	63	54	45	37	28	20	12
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
17	152	154	157	159	162	165	172
	46	37	29	21	12	5	1
	STAY	STAY	STAY	STAY	STAY	STAY	S/L
18	151	154	156	159	162	165	174
	42	34	26	17	9	2	0
	STAY	STAY	STAY	STAY	STAY	STAY	S/L
19	151	154	157	160	163	167	177
	39	31	23	16	8	2	0
	STAY	STAY	STAY	STAY	STAY	LEAVE	LEAVE
20	152	155	159	162	165	170	180
	35	28	20	13	6	-1	-3

Table 14 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN ANNUAL CIV EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
				MAJOR			
	STAY	STAY	STAY	STAY	STAY	S/L	LEAVE
21	154	157	161	164	168	171	182
	34	27	20	14	7	0	-3
	STAY	STAY	STAY	STAY	STAY	STAY	LEAVE
22	155	159	163	167	171	175	183
	33	27	21	14	8	2	-3
	STAY	STAY	STAY	STAY	STAY	STAY	LEAVE
23	157	161	166	170	174	179	185
	33	27	21	15	10	4	-2
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
24	159	164	169	173	178	183	188
	32	27	22	17	12	6	1
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
25	161	167	172	177	182	188	193
	32	27	23	18	14	9	5
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
26	164	170	176	181	187	193	199
	33	29	25	22	18	14	10
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
27	167	173	180	186	193	199	206
	34	31	28	25	22	19	16
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
28	170	177	184	192	199	206	213
	35	33	31	29	27	25	23
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
29	174	182	190	198	206	214	221
	37	36	35	34	32	31	30
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	178	187	196	205	213	222	231

Table 14 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN ANNUAL CIV EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS .7	.8	.9	1.0	1.1	1.2	1.3
				LIEUTENANT COLONEL			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
20	177	181	184	187	191	194	197
	58	51	44	37	29	22	15
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
21	178	182	186	189	193	197	201
	56	50	43	36	30	23	16
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
22	178	182	186	190	194	198	202
	53	47	41	34	28	22	15
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
23	178	182	187	191	196	200	204
	50	44	39	33	27	21	16
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
24	179	184	189	194	199	203	208
	48	43	38	33	27	22	17
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
25	181	186	191	197	202	207	212
	46	42	37	33	28	24	19
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
26	182	188	194	200	206	211	217
	45	42	38	34	30	27	23
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
27	184	190	197	203	210	216	223
	45	42	39	36	33	30	27
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
28	187	194	201	208	215	223	230
	45	43	41	39	37	35	32
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
29	190	198	206	214	222	230	237
	45	44	43	42	41	40	39
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	194	202	211	220	229	237	246

Table 14 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN ANNUAL CIV EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE CIVILIAN EARNINGS						
	.7	.8	.9	1.0	1.1	1.2	1.3
				COLONEL			
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
22	199	204	208	213	217	222	227
	62	54	47	39	32	25	17
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
23	201	206	211	217	222	227	232
	60	53	47	40	33	26	20
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
24	204	209	215	221	226	232	237
	59	53	47	41	35	29	23
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
25	207	213	219	225	231	237	243
	58	53	47	42	37	32	26
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
26	210	217	223	230	237	244	250
	58	54	49	45	41	36	32
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
27	212	220	227	235	242	250	257
	57	54	50	47	43	40	36
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
28	215	223	231	240	248	256	265
	56	54	51	49	46	44	42
	STAY	STAY	STAY	STAY	STAY	STAY	STAY
29	218	227	236	245	255	264	273
	56	54	53	52	50	49	48
	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	221	232	242	252	262	272	282

Table 15

PRESIDENT'S COMMISSION II - CHANGES IN ANNUAL MIL EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
			CAPTAIN		
	STAY	STAY	STAY	STAY	STAY
7	117	131	145	159	172
	10	23	37	51	65
			MAJOR		
	STAY	STAY	STAY	STAY	STAY
12	130	145	160	175	189
	9	22	35	48	61
	STAY	STAY	STAY	STAY	STAY
13	133	148	163	178	193
	10	23	36	48	61
	STAY	STAY	STAY	STAY	STAY
14	136	151	166	182	197
	11	23	36	49	62
	STAY	STAY	STAY	STAY	STAY
15	139	154	169	185	200
	12	24	36	49	61
	STAY	STAY	STAY	STAY	STAY
16	142	157	173	188	204
	13	25	37	49	62
	STAY	STAY	STAY	STAY	STAY
17	133	145	159	173	187
	2	10	21	31	41
	STAY	STAY	STAY	STAY	STAY
18	134	145	159	173	187
	1	8	17	27	37
	STAY	STAY	STAY	STAY	STAY
19	136	146	160	174	188
	1	6	16	25	34
	LEAVE	STAY	STAY	STAY	STAY
20	138	148	162	176	189
	-2	5	13	22	30

Table 15 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN ANNUAL MIL EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
			MAJOR		
	LEAVE	STAY	STAY	STAY	STAY
21	139	150	164	178	192
	-2	5	14	22	30
	LEAVE	STAY	STAY	STAY	STAY
22	141	153	167	181	195
	-1	7	14	22	30
	STAY	STAY	STAY	STAY	STAY
23	142	156	170	184	198
	1	8	15	23	30
	STAY	STAY	STAY	STAY	STAY
24	146	160	173	187	201
	3	10	17	24	31
	STAY	STAY	STAY	STAY	STAY
25	149	163	177	191	205
	5	12	18	25	32
	STAY	STAY	STAY	STAY	STAY
26	154	168	181	195	209
	9	15	22	28	34
	STAY	STAY	STAY	STAY	STAY
27	159	172	186	200	214
	13	19	25	31	37
	STAY	STAY	STAY	STAY	STAY
28	164	178	192	206	219
	18	24	29	35	40
	STAY	STAY	STAY	STAY	STAY
29	170	184	198	212	226
	23	28	34	39	44
	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	177	191	205	219	233

Table 15 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN ANNUAL MIL EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
	LIEUTENANT COLONEL				
	STAY	STAY	STAY	STAY	STAY
20	155	171	187	204	220
	15	26	37	47	58
	STAY	STAY	STAY	STAY	STAY
21	157	173	189	206	222
	16	26	36	47	57
	STAY	STAY	STAY	STAY	STAY
22	158	174	190	206	222
	15	25	34	44	54
	STAY	STAY	STAY	STAY	STAY
23	159	175	191	207	223
	15	24	33	42	51
	STAY	STAY	STAY	STAY	STAY
24	162	178	194	210	225
	15	24	33	41	50
	STAY	STAY	STAY	STAY	STAY
25	165	181	197	212	228
	17	25	33	40	48
	STAY	STAY	STAY	STAY	STAY
26	168	184	200	215	231
	19	27	34	42	49
	STAY	STAY	STAY	STAY	STAY
27	172	188	203	219	235
	22	29	36	43	50
	STAY	STAY	STAY	STAY	STAY
28	177	193	208	224	240
	26	32	39	45	52
	STAY	STAY	STAY	STAY	STAY
29	182	198	214	229	245
	30	36	42	46	54
	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	189	204	220	236	251

Table 15 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN ANNUAL MIL EARNINGS
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	PROPORTION OF BASE CASE MILITARY EARNINGS .8	.9	1.0	1.1	1.2
			COLONEL		
22	STAY 177 17	STAY 195 28	STAY 213 39	STAY 231 51	STAY 249 62
23	STAY 181 18	STAY 199 29	STAY 217 40	STAY 234 51	STAY 252 61
24	STAY 185 20	STAY 203 30	STAY 221 41	STAY 238 51	STAY 256 61
25	STAY 189 23	STAY 207 33	STAY 225 42	STAY 243 52	STAY 261 62
26	STAY 194 27	STAY 212 36	STAY 230 45	STAY 248 54	STAY 266 63
27	STAY 199 30	STAY 217 38	STAY 235 47	STAY 252 55	STAY 270 64
28	STAY 204 33	STAY 222 41	STAY 240 49	STAY 257 57	STAY 275 64
29	STAY 210 37	STAY 228 45	STAY 245 52	STAY 263 59	STAY 281 66
30	MAND. RETIRE. 217	MAND. RETIRE. 234	MAND. RETIRE. 252	MAND. RETIRE. 269	MAND. RETIRE. 287

Table 16

PRESIDENT'S COMMISSION II - CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	CAPTAIN				
	STAY	STAY	STAY	STAY	STAY
7	282	196	145	113	91
	96	58	37	26	19
	MAJOR				
	STAY	STAY	STAY	STAY	STAY
12	292	210	160	126	103
	92	56	35	22	14
	STAY	STAY	STAY	STAY	STAY
13	294	213	163	129	106
	92	57	36	22	14
	STAY	STAY	STAY	STAY	STAY
14	296	217	166	132	109
	92	57	36	22	14
	STAY	STAY	STAY	STAY	STAY
15	297	219	169	135	112
	91	58	36	23	14
	STAY	STAY	STAY	STAY	STAY
16	299	222	173	139	115
	91	58	37	23	14
	STAY	STAY	STAY	STAY	STAY
17	271	204	159	128	108
	62	37	21	10	4
	STAY	STAY	STAY	STAY	STAY
18	267	202	159	129	109
	56	33	17	7	2
	STAY	STAY	STAY	STAY	STAY
19	265	202	160	130	111
	52	30	16	5	1
	STAY	STAY	STAY	STAY	LEAVE
20	265	204	162	132	114
	46	27	13	3	-1

Table 16 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	MAJOR				
21	STAY 264 45	STAY 205 27	STAY 164 14	STAY 135 4	LEAVE 116 -1
22	STAY 264 44	STAY 207 27	STAY 167 14	STAY 138 5	LEAVE 118 -1
23	STAY 264 44	STAY 209 27	STAY 170 15	STAY 141 6	LEAVE 120 -1
24	STAY 264 43	STAY 211 28	STAY 173 17	STAY 145 8	STAY 123 1
25	STAY 264 42	STAY 214 29	STAY 177 18	STAY 150 10	STAY 128 4
26	STAY 264 43	STAY 217 31	STAY 181 22	STAY 155 14	STAY 134 8
27	STAY 265 44	STAY 220 33	STAY 186 25	STAY 160 18	STAY 140 12
28	STAY 265 44	STAY 223 36	STAY 192 29	STAY 167 23	STAY 148 18
29	STAY 266 45	STAY 227 39	STAY 198 34	STAY 175 29	STAY 157 25
30	MAND. RETIRE. 266	MAND. RETIRE. 231	MAND. RETIRE. 205	MAND. RETIRE. 184	MAND. RETIRE. 167

Table 16 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	LIEUTENANT COLONEL				
	STAY	STAY	STAY	STAY	STAY
20	306	235	187	153	128
	83	56	37	23	13
	STAY	STAY	STAY	STAY	STAY
21	304	236	189	156	131
	80	55	36	23	13
	STAY	STAY	STAY	STAY	STAY
22	300	235	190	157	133
	74	51	34	22	12
	STAY	STAY	STAY	STAY	STAY
23	296	235	191	159	135
	69	48	33	21	12
	STAY	STAY	STAY	STAY	STAY
24	294	236	194	162	139
	65	47	33	22	13
	STAY	STAY	STAY	STAY	STAY
25	293	237	197	166	143
	62	45	33	22	14
	STAY	STAY	STAY	STAY	STAY
26	291	238	200	170	148
	60	45	34	25	17
	STAY	STAY	STAY	STAY	STAY
27	289	240	203	175	153
	58	46	36	28	21
	STAY	STAY	STAY	STAY	STAY
28	289	243	208	182	161
	57	47	39	32	26
	STAY	STAY	STAY	STAY	STAY
29	288	246	214	189	169
	55	48	42	37	32
	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	288	249	220	197	179

Table 16 (CONT.)

PRESIDENT'S COMMISSION II - CHANGES IN THE DISCOUNT FACTOR
(THOUSANDS OF DOLLARS)

COMPLETED YEARS OF SERVICE	DISCOUNT FACTOR .9524	.9302	.9091	.8889	.8696
	COLONEL				
	STAY	STAY	STAY	STAY	STAY
22	337	264	213	176	148
	85	58	39	26	15
	STAY	STAY	STAY	STAY	STAY
23	337	266	217	180	152
	81	57	40	27	16
	STAY	STAY	STAY	STAY	STAY
24	337	269	221	185	157
	79	57	41	28	18
	STAY	STAY	STAY	STAY	STAY
25	336	272	225	190	163
	77	57	42	30	21
	STAY	STAY	STAY	STAY	STAY
26	336	275	230	196	170
	76	58	45	34	25
	STAY	STAY	STAY	STAY	STAY
27	335	277	235	202	176
	73	58	47	37	29
	STAY	STAY	STAY	STAY	STAY
28	334	280	240	209	184
	70	58	49	41	34
	STAY	STAY	STAY	STAY	STAY
29	333	283	245	216	193
	68	59	52	45	40
	MAND.	MAND.	MAND.	MAND.	MAND.
30	RETIRE.	RETIRE.	RETIRE.	RETIRE.	RETIRE.
	332	286	252	225	204

Table 17

STATE DESCRIPTIONS

State Number	Grade	Component	Promotion Group
1	Captain	Reserve	
2	Captain	Regular	
3	Major	Reserve	4
4	Major	Reserve	3
5	Major	Reserve	2
6	Major	Reserve	1
7	Major	Regular	4
8	Major	Regular	3
9	Major	Regular	2
10	Major	Regular	1
11	Lieutenant Colonel	Reserve	4
12	Lieutenant Colonel	Reserve	3
13	Lieutenant Colonel	Reserve	2
14	Lieutenant Colonel	Reserve	1
15	Lieutenant Colonel	Regular	4
16	Lieutenant Colonel	Regular	3
17	Lieutenant Colonel	Regular	2
18	Lieutenant Colonel	Regular	1
19	Colonel	Reserve	4
20	Colonel	Reserve	3
21	Colonel	Reserve	2
22	Colonel	Reserve	1
23	Colonel	Regular	4
24	Colonel	Regular	3
25	Colonel	Regular	2
26	Colonel	Regular	1
27	The Civilian State		

Table 18

YEAR OF SERVICE AGGREGATIONS FOR PROMOTION GROUPS

Grade/Promotion Group	Years of Service
Major	
1	8-10
2	11-12
3	13-15
4	16-17
Lieutenant Colonel	
1	11-13
2	14-16
3	17-18
4	19-24
Colonel	
1	13-16
2	17-21
3	22-23
4	24-29