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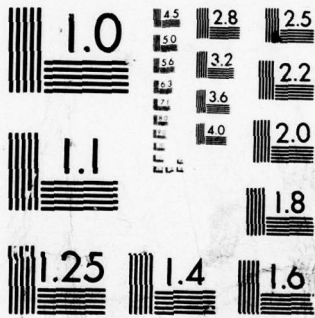
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AGGREGATE SEA/SHORE ROTATION MODEL (MOSES)

By LCdr. R. J. Waterman, USN; Donald Maurer;
R. LaVar Huntzinger

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20 routine and subroutines are included. ↙

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- 2. This Research Contribution describes a computer model that interrelates sea/shore rotation, continuation, billet structure, and the enlisted personnel inventory. The model is being used by Navy manpower planners to analyze billet structure and personnel policies to see if they are mutually consistent, and to assess the effects of proposed policy changes. This work is intended for computer programmers charged with the installation and operation of the model, as well as manpower and personnel managers.
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PROBLEM DESCRIPTION AND COMPUTATIONAL PROCEDURE

The FORTRAN computer program MOSES implements the aggregate sea/shore rotation model presented in appendix D. This model is designed for analysis of any community whose billets and personnel can be segregated into the four groups shown in figure 1.

These four groups are first-term sea, first-term shore, career sea, and career shore. The flows of personnel between these groups are limited to the paths indicated in figure 1. The bottom arrows represent losses from the career force. The actual number of personnel moving from one category to another is determined by the sea/shore rotation pattern to be followed and the continuation behavior of first-term and career personnel.

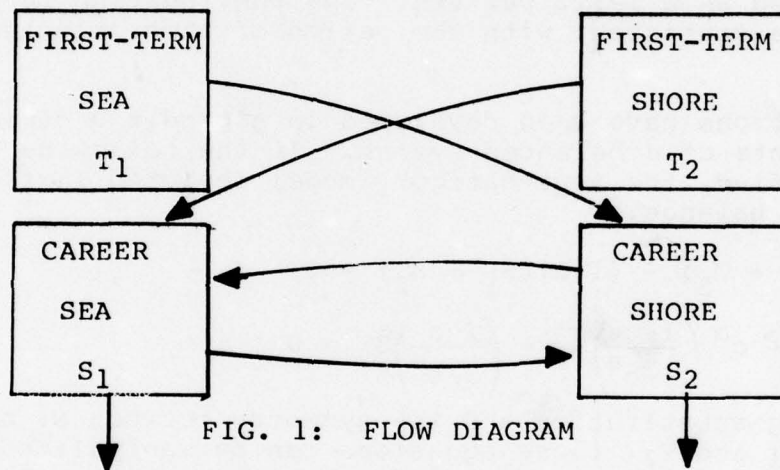


FIG. 1: FLOW DIAGRAM

A balanced system is defined as a steady state structure in which the number of personnel in the four billet groups, and the flows between the groups, remain constant over time. In a balanced system, accessions remain the same each year and manning levels remain steady because gains equal losses for each billet group.

Eight parameters determine a balanced system: the number of billets in the four categories T_1 , T_2 , S_1 , S_2 , the first-term transition rate, r , the career continuation rate, c , and the sea/shore rotation pattern, $a:b$. The continuation behavior of first-term personnel is represented by a single parameter, r , which

is the ratio of the per period flow of personnel into the career force, to the total number of personnel serving their first tour. Continuation behavior for the career categories is represented by an average continuation rate, c , which is the percentage of all career personnel retained for one period. The computation of this parameter, from the more familiar length of service continuation rates, is presented in appendix A.

For an a:b rotation pattern it is assumed that career personnel are assigned to sea duty for a periods and shore duty for b periods.

A period of sea or shore duty may be one year, six months, or even one month. Usually rotation patterns are adjusted in three-month increments and a quarter is the standard period. Thus a three-year sea duty/three-year shore duty rotation pattern would be represented as a 12:12 pattern. The continuation parameters, c and r , must be consistent with the period of time selected for a and b.

Equations have been developed in appendix D depicting the requirements of a balanced system. If the following two equations are satisfied, the four-category model depicted in figure 1 will remain in balance:

$$r(T_1 + T_2) - (1-c)(S_1 + S_2) = 0$$

$$rT_1 + c^a \left(\frac{1-c}{1-c^a} \right) S_1 - \left(\frac{1-c}{1-c^b} \right) S_2 = 0$$

Using substitution and the symmetry between S_1 and S_2 and between T_1 and T_2 , these equations can be manipulated to produce many balanced systems for various inputs. Two examples of the questions the model now answers are:

1. Given first-term sea billets (T_1), career sea billets (S_1), the first-term transition rate (r) and the career continuation rate (c), for any desired rotation pattern (a:b) how many shore billets, both career (S_2) and first-term (T_2), are required for a balanced sea/shore rotation system? The equations for this solution are:

$$T_2 = -c^b T_1 + \left(\frac{1-c^{a+b}}{r} \right) \left(\frac{1-c}{1-c^a} \right) S_1$$

and

$$S_2 = \frac{r(T_1 + T_2)}{1-c} - S_1$$

This is structure A in table 1.

2. Given the total number of sea billets $(T + S)$, the total number of shore billets $(T_2 + S_2)$ and the continuation behaviors (c, r) , for each rotation pattern $(a:b)$ what are the sizes of the individual billet groups T_1, T_2, S_1 and S_2 in a balanced system? The solution is:

Let SB = total sea billets $(T_1 + S_1)$
 SHB = total shore billets $(T_2 + S_2)$

$$X = \frac{(1-c^{a+b})(1-c)}{r(1-c^a)}$$

and

$$Y = \frac{(1-c)(SB + SHB)}{r + 1 - c}$$

then

$$T_2 = \frac{X(SB - Y) - Yc^b}{1-c^b - X}$$

$$S_2 = SHB - T_2$$

$$T_1 = Y - T_2$$

and

$$S_1 = T_1 S_1 - T$$

This is structure F in table 1.

The computer program MOSES calculates 10 balanced structures for each rotation pattern (a:b) specified by the user. Table 1 is a list of the inputs and outputs for each of the structures.

TABLE 1
 INPUTS/OUTPUTS FOR THE BALANCED STRUCTURES
 COMPUTED BY MOSES

<u>User inputs</u>	<u>Balanced systems</u>									
	A	B	C	D	E	F	G	H	I	J
T ₁	*		*					*	*	*
T ₂			*	*	=0			*	*	*
S ₁	*	*					*	*	*	*
S ₂		*								*
c	*	*	*	*	*	*	*	*		
r	*	*	*	*	*	*	*		*	
T ₁ + S ₁				*	*	*				
T ₂ + S ₂						*				
T ₁ + T ₂							*			
<u>Program outputs</u>										
T ₁		*		*	*	*	*			
T ₂	*	*				*	*			
S ₁			*	*	*	*				
S ₂	*		*	*	*	*	*	*	*	
c									*	*
r								*		*

The input/output list of 10 balanced structures is certainly not exhaustive of the possible combinations of inputs and outputs. For example, in structures H and I the output variable S_2 could easily change places with T_1 , T_2 , or S_1 in the input list. Adding to, altering or deleting any of these balanced systems in the computer program would require a change or addition of approximately 15 lines of code. The program has a subroutine, CHECK, which can be used to determine if added or altered structures are in balance. This aids the user in finding any errors in calculation or programming.

GENERAL DESCRIPTION OF COMPUTER PROGRAM

The program is modular in structure to facilitate changes in logic, options, problems, -- input and output. The main routine MOSES and all subroutines are written in FORTRAN. With minor modifications the program can be run on any sufficiently large computer with a FORTRAN compiler. The subroutines are used as though part of one large program and most of the interchange of values between the subroutines is done through the use of both labeled and unlabeled common regions.

MOSES consists of the main routine MOSES and the five subroutines BALANZ, CHECK, FEASBL, PRINTT, ROTATE.

MOSES reads in control information and data to start the problem. MOSES assigns default values to any parameters not specified by the user and prints a summary of the input data, parameters, tolerances and options to be used. It then invokes BALANZ or ROTATE or both.

ROTATE writes out heading information and computes 10 balanced structures for the first sea/shore rotation pattern (a:b). As each structure is computed, control is transferred to PRINTT. If the option has been selected by the user, PRINTT will call the subroutine FEASBL and FEASBL will determine if this newly computed billet structure is within the user specified tolerances. Only feasible balanced systems will be printed out. If FEASBL is not called, all balanced systems will be printed. ROTATE then computes 10 balanced structures for the next sea/shore rotation pattern with PRINTT being called for each structure.

BALANZ computes, for each of the 10 input/output choices, a balanced system for every sea/shore rotation pattern specified by the user. BALANZ also calls PRINTT.

Table 2 gives the relationships existing between the routines making up the MOSES code. Each column of the table corresponds to a routine/subroutine in the code that calls other routines or functions. The "*" in the column identifies the routine or function that the routine may possibly call. The rows can be used to determine which routines might possibly call the routine corresponding to the column. This table should be consulted if any alterations are made to the computer code.

TABLE 2
THE RELATIONSHIP EXISTING BETWEEN THE ROUTINES
MAKING UP THE MOSES CODE

	<u>MOSES</u>	<u>BALANZ</u>	<u>PRINTT</u>	<u>ROTATE</u>
		Calls		
ABS ¹		*		*
BALANZ	*			
CHECK ²		*	*	*
FEASBL			*	
FLOAT ¹			*	
PRINTT		*		*
ROTATE	*			

¹ This is an intrinsic FORTRAN function.

² CHECK may be called whenever a new balanced structure is completed. The user must insert the statement CALL CHECK in BALANZ, PRINTT, or ROTATE.

MOSES

MOSES is the main program routine that initiates the aggregate sea/shore rotation algorithm; it is not a subroutine. The input of data, parameters and options is done in MOSES. Default values are provided for almost all options and parameters although blank cards should always be supplied by the user for all READ statements. Depending upon the input value of the variable ALPHA, MOSES transfers control to BALANZ and/or ROTATE for the actual computation of the balanced billet structures and continuation rates. BALANZ and ROTATE calculate the same balanced structures but group the output differently.

BALANZ

Subroutine BALANZ calculates the outputs for each set of inputs. The 10 input/output relationships evaluated by MOSES are shown in table 1. Choosing input combination A, BALANZ calculates the correct output for each sea/shore rotation pattern selected by the user. BALANZ repeats this operation for each input/output structure A, B, C ... J.

CHECK

Subroutine CHECK computes the flows into and out of the total career force ($S_1 + S_2$) and the gains and losses of the career sea force (S_1). If the gains equal the losses for each of these groups the system is in flow balance. CHECK is not at present called in MOSES. The user must insert the statement CALL CHECK after a balanced system has been computed in ROTATE, BALANZ, or PRINTT. If the user chooses to insert a new routine for computing an eleventh balanced system, CHECK may be used for detecting computational or programming errors.

FEASBL

If desired by the user, subroutine FEASBL is called by PRINTT. FEASBL checks to see that T_1 , T_2 , S_1 , and S_2 are within user specified tolerances. Only the billet structures which are within these feasible limits are printed out.

PRINTT

Subroutine PRINTT controls the program output. For each balanced system computed by BALANZ or ROTATE, the following values are printed: T_1 , T_2 , S_1 , S_2 , C, R, and the sea/shore rotation pattern (a:b). In addition, total sea billets, total shore billets, total first-term billets and total career billets are printed.

ROTATE

Subroutine ROTATE computes the same balanced systems as BALANZ but groups them differently. ROTATE selects the first sea/shore rotation pattern (a:b). For this rotation pattern, ROTATE calculates the 10 billet structures A through J in table 1. Selecting the next rotation pattern, ROTATE calculates A through J again. This procedure continues until 10 billet structures have been computed for each pattern (a:b).

USER-SUPPLIED CARDS

The present MOSES code requires that the user provide four input cards listing between 7 and 26 variables. These cards specify the billet structure inputs to be used by MOSES and the computational strategy to be followed. The user must supply variables 1 through 7 on input card 1. MOSES provides default values for variables 8 through 26 which are input on cards 2 through 4; the program will use the default values for all variables set to zero.

The names, formats, and default values for these 26 variables are listed in table 3. Because the model will run with as few as 7 variables, the READ statements could be removed and DATA statements used for the initial input.

TABLE 3

INPUT CARDS

INPUT CARD 1

<u>Columns</u>	<u>Format</u>	<u>Name</u>	<u>Meaning</u>
1-10	F10.0	ALPHA	Option used to determine the grouping of the printed output. With ALPHA = 0.0, MOSES calls BALANZ. With ALPHA = 1.0, MOSES calls ROTATE. With ALPHA = 2.0, MOSES calls both ROTATE and BALANZ.
11-20	F10.0	T1	The desired number of first-term sea billets.
21-30	F10.0	T2	The desired number of first-term shore billets.
31-40	F10.0	S1	The desired number of career sea billets.
41-50	F10.0	S2	The desired number of career shore billets.
51-60	F10.5	C	The annual career continuation rate.
61-70	F10.5	R	The annual first-term transition rate.

INPUT CARD 2

<u>Columns</u>	<u>Format</u>	<u>Name</u>	<u>Default</u>	<u>Meaning</u>
1-10	F10.0	T1T2	T1+T2	The desired number of first-term billets.
11-20	F10.0	T1S1	T1+S1	The desired number of sea billets.
21-30	F10.0	T2S2	T2+S2	The desired number of shore billets.
31-40	F10.0	S1S2	S1+S2	The desired number of career billets.

TABLE 3 (continued)

INPUT CARD 3

<u>Columns</u>	<u>Format</u>	<u>Name</u>	<u>Default</u>	<u>Meaning</u>
1-9	F9.3	A	3.0	Minimum career sea duty tour in years.
10-18	F9.3	B	2.0	Minimum career shore duty tour in years.
19-24	F6.0	PERIOD	4.	Number of standard rotation intervals in one year. If the standard rotation period is 3 months, PERIOD = 4.
25-32	F8.5	EPS	.0001	Absolute error value used to calculate a correct career continuation rate.
33-38	F6.0	SEATIM	(2. x PERIOD) + 1	Number of sea duty periods to be calculated for each shore duty period.
39-44	F6.0	SHOTIM	PERIOD+1	Number of shore duty periods to be calculated for each sea duty period.

INPUT CARD 4

<u>Columns</u>	<u>Format</u>	<u>Name</u>	<u>Default</u>	<u>Meaning</u>
1-7	F7.3	PERCEN	0.0	The maximum absolute percentage difference, specified by the user, between each group of the present billet structure (T_1, T_2, S_1, S_2) and the computed billet structures. If PERCEN = 0 this option will be ignored and all billet structures computed will be printed. If PERCEN > 0, all billet structures within a + PERCEN of the present structure will be printed. If PERCEN = -1 the following eight variables supplied by the user will be utilized to determine which billet structure will be printed.

TABLE 3 (Continued)

INPUT CARD 4

<u>Columns</u>	<u>Format</u>	<u>Name</u>	<u>Default</u>	<u>Meaning</u>
8-15	F8.0	T1MIN	0.0	Minimum number of first-term sea billets.
16-23	F8.0	T1MAX	99999999	Maximum number of first-term sea billets.
24-31	F8.0	T2MIN	0.0	Minimum number of first-term shore billets.
32-39	F8.0	T2MAX	99999999	Maximum number of first-term shore billets.
40-47	F8.0	S1MIN	0.0	Minimum number of career sea billets.
48-55	F8.0	S1MAX	99999999	Maximum number of career sea billets.
56-63	F8.0	S2MIN	0.0	Minimum number of career shore billets.
64-71	F8.0	S2MAX	99999999	Maximum number of career shore billets.

EXAMPLES OF THE USE OF MOSES

Three examples of the use of MOSES follow.

1. In ratings with a heavy concentration of sea duty billets, how many shore duty billets are required for rotational purposes for various sea/shore rotation policies? Knowing the shore duty billet requirements for rotation, how many excess shore billets exist and could be manned by women or civilians?

Using an annual first-term transition rate, $r = 0.09345$, and an annual career continuation rate, $c = 0.86$, how many shore billets, S_2 and T_2 , are required to rotate $T_1 = 144,835$ sea billets for first-term personnel and $S_1 = 74,612$ sea billets for career personnel? These numbers represent the present billet structure and continuation behavior for the nonstudent male component of the Navy minus approximately 10 ratings that have an unusually large shore billet to sea billet ratio. Currently there exist $T_2 = 35,550$ first-term shore billets and $S_2 = 51,158$ career shore billets.

This problem illustrates many of the characteristics of the code when it is used to solve for feasible billet structures, continuation rates and sea/shore rotation policies.

First input card format is (5F10.0, 2F10.5).

ALPHA is set equal to 2.0. This option allows all printed output to be presented under two different groupings. $T_1 = 144,835$, $T_2 = 35,550$, $S_1 = 74,612$, $S_2 = 51,158$, $C = 0.86$, and $R = 0.09345$.

If the three remaining input cards are left blank, default values will be provided by the program. The default values will be shown here as inputs.

Second input card format is (4F10.0). $T_1T_2 = 180,385$ total first-term billets, $T_1S_1 = 219,447$ total sea billets, $T_2S_2 = 86,708$ shore billets, and $S_1S_2 = 125,770$ career billets.

Third input card format is (2F9.3, F6.0, F8.5, 2F6.0). $A = 3.0$ years minimum sea tour, $B = 2.0$ years minimum shore tour, PERIOD = 4 rotation intervals in one year (four quarters), EPS = .0001 and is the absolute error value for calculating a career continuation rate for the balanced systems I and J. A value of

less than .0001 was not found to significantly increase the accuracy of the solution. SEATIM = 9 sea duty periods to be calculated for each shore duty period, SHOTIM = 5 shore duty periods to be calculated for each sea duty period.

The final input card format is (F7.3, 8F8.0). For the initial run there was no desire to limit the printed output and all nine of these parameters, PERCEN, T1MIN, T1MAX, T2MIN, T2MAX, S1MIN, S1MAX, S2MIN, S2MAX, were equal to zero.

If the user desires to examine only balanced systems whose billet structures are within 30 percent (or any user determined percentage) of the present structure for sea/shore rotation patterns with maximum sea tours no greater than 4 years (in this example all feasible combinations from 12/8 to 16/12 quarters), the four input cards, in the proper format, would be

(1.0, 144,835, 35,550, 74,612, 51,158, 0.86, 0.09345)

(blank card)

(3.0, 2.0, 0.0, 0.0, 5.0, 5.0)

(0.30, blank).

If any balanced system with a career shore component of less than 70,000 and a first-term shore component of less than 50,000 is to be printed, the fourth input card would be

(-1.0, 0., 0., 0., 50000., 0., 0., 0., 70000.).

Part or all of the computer output from these three sets of input parameters is in appendix C.

The shore billet requirements for $T_1 = 144,835$ and $S_1 = 74,612$ are presented in table 4 for various rotation policies. If a 12/12 rotation policy was followed, 85,801 additional shore billets would have to be provided for a balanced system. If a 16/8 rotation policy was followed, 293 additional shore billets would have to be followed, 15,388 shore billets would be available for substitution of women or civilians.

TABLE 4
 SHORE BILLET REQUIREMENTS WHEN $r=0.0935$, $c=0.8600$,
 $T_1 = 144,835$, and $S_1 = 74,612$

<u>Rotation (a:b)</u>	<u>Career shore billets (S_2)</u>	<u>First-term shore billets (T_2)</u>
12:8	58,662	54,827
12:12	82,288	90,221
13:8	55,387	49,920
14:9	58,169	54,088
16:8	48,059	38,942
16:12	67,414	67,939
17:9	51,107	43,508
20:8	41,782	29,538
20:12	58,610	54,748

2. What sea/shore rotation pattern is best suited to the present billet structure given the continuation characteristics of the personnel inventory?

In order to determine what rotation pattern provides billet structures and continuation rates resembling the Navy's present structure and continuation rates, MOSES was rerun with PERCEN = 0.05. This output is in table 5 which shows that today's billet structure and continuation rates most closely resemble the balanced systems provided by a rotation policy of 17/9 or perhaps 20/10.

Table 6 shows 10 balanced billet structures and continuation rates for a 3/3 rotation pattern. Any attempt to rotate the group of ratings in this sample on a 3/3 pattern would require drastic changes in the Navy's desired billet structure and the continuation behavior of the enlisted personnel.

3. How sensitive is a balanced rotation system to fluctuations in the continuation rates?

The sensitivity of the billet structure to fluctuations in the rates c and r is illustrated in tables 7, 8 and 9.

Even slight alterations in c and r cause sizable changes in shore billet requirements. This type of analysis should be quite helpful when evaluating proposals for sea pay or reenlistment bonuses.

TABLE 5

BALANCED BILLET STRUCTURES WITHIN FIVE PERCENT
OF THE PRESENT STRUCTURE

Rotation (a:b)	First- term sea billets (T) ₁	First- term shore billets (T) ₂	Career sea billets (S) ₁	Career shore billets (S) ₂	Career continuation rate (c)	First- term retention rate (r)
14:8	148,438	35,550	71,009	51,803	.8600	.0935
14:8	144,835	35,550	74,612	53,469	.8683	.0935
15:8	144,835	35,550	71,375	49,032	.8600	.0935
15:8	147,195	35,550	72,252	49,731	.8600	.0935
15:8	146,714	36,888	72,733	49,820	.8600	.0935
15:8	144,835	35,550	74,612	51,256	.8600	.0977
15:8	144,835	35,550	74,612	50,741	.8656	.0935
16:8	144,835	35,550	74,612	48,622	.8600	.0956
17:9	147,763	35,550	71,684	50,678	.8600	.0935
17:9	144,835	35,550	74,612	52,608	.8600	.0987
17:9	144,835	35,550	74,612	51,874	.8668	.0935
18:9	146,788	35,550	72,659	49,051	.8600	.0935
18:9	144,835	35,550	74,612	50,276	.8600	.0969
18:9	144,835	35,550	74,612	49,776	.8644	.0935
19:10	148,373	35,550	71,074	51,695	.8600	.0935
19:10	144,835	35,550	74,612	53,069	.8679	.0935
20:10	144,835	35,550	70,964	49,443	.8600	.0935
20:10	147,512	35,550	71,935	50,259	.8600	.0935
20:10	147,181	36,420	72,266	50,288	.8600	.0935
20:10	144,835	35,550	74,612	51,985	.8600	.0935
20:10	144,835	35,550	74,612	51,220	.8660	.0935

TABLE 6
BALANCED BILLET STRUCTURES FOR A 3/3
(12/12 QUARTERS) ROTATION PATTERN

First-term sea billets (T ₁)	First-term shore billets (T ₂)	Career sea billets (S ₁)	Career shore billets (S ₂)	Career continu- ation rate (c)	First-term retention rate (r)
144,835	90,221	74,612	82,288	.8600	.09345
10,775	177,645	74,612	51,158	.8600	.09345
144,835	35,550	52,523	67,884	.8600	.09345
144,835	-27,931	26,875	51,158	.8600	.09345
162,317	35,550	57,130	74,947	.8600	.09345
173,685	0	45,762	70,173	.8600	.09345
169,024	14,577	50,423	72,131	.8600	.09345
-12,321	192,706	74,612	45,795	.8600	.09345
144,835	35,550	74,612	96,432	.8600	.13280
144,835	35,550	74,612	90,010	.8976	.09345

TABLE 7
CHANGES IN CAREER CONTINUATION

Rotation pattern (quarters)	Shore billets needed for rotation			
	Current c=0.860	Low c=0.824	Medium c=0.857	High c=0.878
12:12	172,509	213,575	176,068	150,592
14:12	151,223	190,489	154,619	130,341
16:12	135,353	173,336	138,631	115,221
12:8	113,489	153,559	116,915	92,574
17:10	106,436	143,885	109,645	86,810
18:10	101,475	138,508	104,645	82,093
16:8	87,001	124,404	90,190	67,566
17:8	82,365	119,327	85,515	63,181
20:18	71,320	107,281	74,378	52,714

TABLE 8

CHANGES IN FIRST-TERM TO CAREER TRANSITION RATE

Rotation pattern (quarters)	Shore billets needed for rotation		
	Current $r=0.09345$	Decrease $r=0.07943$	Increase $r=0.10747$
12:12	172,509	200,059	153,464
14:12	151,223	176,521	133,843
16:12	135,353	159,241	119,214
12:8	113,489	138,793	95,725
17:10	106,436	128,922	90,951
18:10	101,475	123,436	86,378
16:8	87,001	109,502	71,309
17:8	82,365	104,375	67,036
20:8	71,320	92,161	56,855

TABLE 9

CHANGES IN CAREER AND FIRST-TERM CONTINUATION

Rotation pattern (quarters)	Shore billets needed for rotation		
	Current $c=0.8600$ $r=0.09345$	Low $c=0.8240$ $r=0.07943$	High $c=0.8780$ $r=0.10747$
12:12	172,509	248,019	134,289
14:12	151,223	222,271	115,534
16:12	135,353	203,141	101,531
12:8	113,489	185,347	77,325
17:10	106,436	172,330	73,652
18:10	101,475	166,332	69,284
16:8	87,001	152,831	54,164
17:8	82,365	147,169	50,104
20:8	71,320	133,734	40,409

APPENDIX A

COMPUTATION OF CONTINUATION RATES

Continuation rates for enlisted communities are available to Navy planners on a length of service (LOS) basis. One source is the PROPHET model which calls the rates for length of service categories "bag rates".¹ The first-term transition rate and average career continuation rate used in this rotation model are calculated from these bag rates.

Suppose that the first tour is h periods long and that personnel begin that tour at the end of their i th period of service. In a steady state the number of personnel in the j th LOS category is

$$X_j = X_1 \quad \text{for } j=1$$

and

$$X_j = X_1 \prod_{k=1}^{j-1} C_k \quad \text{for } j \geq 2$$

where C_i is the continuation rate for personnel with LOS greater than $i-1$ but not greater than i and X_1 is the number of personnel with length of service less than or equal to one period. The product notation means

$$\prod_{k=1}^{j-1} C_k = C_1 \cdot C_2 \cdot C_3 \cdot \dots \cdot C_{j-1}.$$

Therefore, the number of personnel assigned to their first tour is

$$T = \sum_{j=i+1}^{i+h} X_j = X_1 \sum_{j=i+1}^{i+h} \left(\prod_{k=1}^{j-1} C_k \right).$$

The flow of personnel completing their first tour is

$$f = X_1 \prod_{k=1}^{i+h} C_k.$$

¹Center for Naval Analyses, Memorandum (CNA)77-1310, "Projections of Navy Enlisted Endstrength with the PROPHET Model: FY 1977-83," by Peter B. McWhite, Unclassified, 30 Aug 1977

The transition rate from the first-term to the career category is

$$r = \frac{f}{T} = \frac{\prod_{k=1}^{i+h} C_k}{\sum_{j=i+1}^{i+h} \left(\prod_{k=1}^{j-1} C_k \right)}$$

$$C = \frac{\sum_{j=i+h+2}^L \left(\prod_{k=1}^{j-1} C_k \right)}{\sum_{j=i+h+1}^L \left(\prod_{k=1}^{j-1} C_k \right)}$$

The following table presents these continuation parameters calculated for several enlisted groups using the above formulas and LOS bag rates for 1977. The first tour is assumed to consist of LOS categories two, three, and four. For this table, $i=1$, $h=3$, and $L=31$.

TABLE A-1

CONTINUATION PARAMETERS FOR SOME ENLISTED GROUPS

<u>Continuation Parameter</u>	<u>AC</u>	<u>AD</u>	<u>AM</u>	<u>BM</u>	<u>BT</u>
c ₂	0.9100	0.9017	0.8924	0.7810	0.7818
c ₃	0.8304	0.8286	0.8746	0.6849	0.8121
c ₄	0.4441	0.3953	0.4526	0.5362	0.3062
c ₅	0.8388	0.8388	0.9146	0.8958	0.8911
c ₆	0.7226	0.8699	0.8733	0.8960	0.8894
c ₇	0.8703	0.8966	0.9285	0.9351	0.9457
c ₈	0.8117	0.9023	0.8592	0.8764	0.8547
c ₉	0.7323	0.9084	0.8758	0.9197	0.8349
c ₁₀	0.8600	0.9250	0.8918	0.9085	0.7925
c ₁₁	0.9200	0.9725	0.9640	0.9327	0.9131
c ₁₂	0.9546	0.9689	0.9552	0.9576	0.9279
c ₁₃	1.0000	0.9620	0.9627	0.9614	0.8977
c ₁₄	0.9758	0.9678	0.9768	0.9464	0.9367
c ₁₅	0.9889	0.9720	0.9886	0.9623	0.9612
c ₁₆	0.9664	0.9753	0.9946	0.9668	0.9501
c ₁₇	0.9626	0.9810	0.9885	0.9620	0.9840
c ₁₈	0.9525	0.9440	0.9252	0.9471	0.8998
c ₁₉	0.6532	0.5470	0.6070	0.6874	0.6262
c ₂₀	0.5936	0.5184	0.5723	0.5133	0.4580

TABLE A-1
(continued)

<u>Continuation Parameter</u>	<u>AC</u>	<u>AD</u>	<u>AM</u>	<u>BM</u>	<u>BT</u>
c ₂₁	0.6990	0.6444	0.6227	0.4964	0.5940
c ₂₂	0.6931	0.6369	0.7129	0.6260	0.7565
c ₂₃	0.9231	0.7438	0.7541	0.7038	0.7332
c ₂₄	0.8000	0.8747	0.7302	0.8059	0.6303
c ₂₅	1.0000	0.7509	0.8859	0.8756	0.4800
c ₂₆	0.8333	0.5402	0.5714	0.7934	0.6111
c ₂₇	1.0000	0.6685	0.7500	0.6552	1.0000
c ₂₈	0.6000	0.6667	1.0000	1.0000	1.0000
c ₂₉	0.8000	0.8549	0.5952	0.8194	0.8000
c ₃₀	0.0833	0.1042	0.0000	0.2687	0.0000
c ₃₁	0.0000	0.0000	0.0000	0.0000	0.0000
r	0.1259	0.1115	0.1322	0.1238	0.0804
c	0.8405	0.8870	0.8923	0.8940	0.8725

APPENDIX B

PROGRAM LISTINGS AND FLOWCHARTS

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10 $RESET FREE
20 FILE 20(KIND=DISK,TITLE='MOSES1',PROTECTION=SAVE,MAXRECSIZE=23)
30 FILE 10(KIND=DISK,TITLE='R066',FILETYPE=8)
40 FILE 20(KIND=PRINTER,MAXRECSIZE=22)
50 COMMON SEA,SHORE,T12,S12,S22,PERCENT,IDENT
60 CCMPCA /TAL1/ SIMIN,SIMAX,T1MIN,T1MAX,S2MIN,S2MAX
70 *T2MIN,T2MAX
80 COMMON /FCT1/ T1,T2,S1,S2,C,R,C1,C2,KSEATH,KSHOTN,PERIOD,EPS,
90 *T12,T1S1,T2S2,S1S2
100 READ (10,33) ALPHA,T1,T2,S1,S2,C,R
110 REAC (10,44) T12,T1S1,T2S2,S1S2
120 READ (10,55) A,B,PERICC,EPS,SEATIP,SHOTIM
130 READ (10,66) PERCENT,T1MIN,T1MAX,T2MIN,T2MAX,S1MIN,S1MAX,
140 *S2MIN,S2MAX
150 33 FORMAT (5F10.0,2F10.5)
160 44 FORMAT (4F10.0)
170 55 FORMAT (2F9.3,F6.0,F8.5,2F6.0)
180 66 FORMAT (F7.3,8F8.0)
190 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
200 CCC
210 CC
220 C   THESE ARE THREE METHODS OF GROUPING OUTPUT:
230 C   1. BY INPUTS OR SOLUTION VARIABLES (SUBROUTINE BALAN2)
240 C   2. BY ROTATION PATTERNS (SUBROUTINE ROTATE)
250 C   3. BY ECTH
260 CCC
270 C   BY INTER-CHANGING THE INPLT AND OUTPUT VARIABLES THE PROGRAM
280 C   PRESENTLY SOLVES FOR 10 BALANCED BILLET STRUCTURES FOR EACH OF
290 C   THE DESIRED QUARTERLY ROTATION PATTERNS. IF THE USER ALLOWS THE
300 C   DEFAULT ROTATION PATTERNS TO BE EMPLOYED THERE ARE 45 DIFFERENT
310 C   ROTATION PATTERNS RANGING BETWEEN 2 TO 5 YEARS AT SEA AND 2 TO 3
320 C   YEARS AS-PCRE. THIS PROVIDES 450 BALANCED SYSTEMS WHICH MAY BE
330 C   GROUPED IN ANY ONE OF THREE STYLES:
340 C   1. FOR EACH OF THE 10 INPUT/OUTPUT STRUCTURES DISPLAY ALL
350 C   SELECTED ROTATION PATTERNS. THIS OPTION IS ALPHA=0.0
360 C   2. FOR EACH ROTATION PATTERN DISPLAY ALL 10 BALANCED
370 C   STRUCTURES. THIS OPTION IS SELECTED BY SETTING ALPHA=1.0
380 C   3. ALL OUTPUT WILL BE SHOWN TWICE GROUPEC AS IN #1 AND #2
390 C   THIS OPTION IS ALPHA=2.0
400 CCC
410 CCC
420 C   SOME OR ALL OF THE FOLLOWING ELEVEN INPUTS ARE MANDATORY INPUTS
430 C   DEPENDING UPON WHICH OF THE BALANCED BILLET STRUCTURES THE USER
440 C   DESIRES. IF THE FIRST SEVEN VARIABLES ARE PROVIDED THEN ALL TEN
450 C   BALANCED SYSTEMS WILL BE COMPUTED FOR EACH OF THE ROTATION PATTERNS
460 CC
470 C   ALPHA-EXPLAINED ABOVE
480 C   T1----FIRST-TERM SEA BILLETS
490 C   T2----FIRST-TERM SHORE BILLETS
500 C   S1----CAREER SEA BILLETS
510 C   S2----CAREER SHORE BILLETS
520 C   C ----ANNUAL CAREER CONTINUATION RATE
530 C   R ----ANNUAL FIRST-TERM RETENTION RATE
540 CC
550 C   IF THE FOLLOWING FOUR VARIABLES ARE LEFT EQUAL TO ZERO DEFAULT
560 C   VALUES WILL BE COMPUTED BY THE PROGRAM
570 CC
580 CC
590 C   T1T2---TOTAL FIRST-TERM BILLETS (T1+T2)
600 C   T1S1---TOTAL SEA DUTY BILLETS (T1+S1)
610 C   T2S2---TOTAL SHORE DUTY BILLETS (T2+S2)

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620 C S1S2---TOTAL CAREER BILLET (S1+S2)
630 CCCCCCCCC
640 CC
650 C THE FOLLOWING 6 VARIABLES ARE OPTIONAL INPUTS; IF LEFT EQUAL TO
660 C ZERO, DEFAULT VALUES WILL BE USED BY THE PROGRAM
670 CC
680 CC
690 C A-----MINIMUM SEA DUTY TOUR IN YEARS (DEFAULT IS 3)
700 C B-----MINIMUM SHORE DUTY TOUR IN YEARS (DEFAULT IS 2)
710 C PERIOD-NUMBER OF STANDARD ROTATION INTERVALS IN ONE YEAR;
720 C IF STANDARD ROTATION INTERVAL IS 3 MONTHS, PERIOD=4;
730 C IF STANDARD ROTATION INTERVAL IS 1 MONTH, PERIOD=12;
740 C (DEFAULT IS 4)
750 C EPS----ABSOLUTE ERROR VALUE USED TO CALCULATE A CORRECT
760 C CAREER CONTINUATION RATE (DEFAULT IS .0001)
770 C SEATIM-NUMBER OF SEA DUTY PERIODS TO BE PRINTED OUT
780 C (A*PERIOD)+SEATIM-1=MAX SEA DUTY TIME
790 C (DEFAULT IS 2.*PERIOD+.1.)
800 C SHGTIM-NUMBER OF SHORE DUTY PERIODS TO BE PRINTED OUT
810 C (E*PERIOD)+SHOTIM-1=MAX SHORE DUTY TIME
820 C (DEFAULT IS 1.*PERIOD+.1.)
830 CC
840 CCCCCCCC
850 CC
860 C THE FOLLOWING 9 VARIABLES ARE ALSO OPTIONAL INPUTS USED TO LIMIT
870 C THE PRINTED OUTPUT OF THE PROGRAM TO ONLY THOSE BILLET STRUCTURES
880 C WHICH ARE WITHIN THE FEASIBLE BOUNDS DETERMINED BY THE USER:
890 CC
900 C PERCENT---THE MAXIMUM ABSOLUTE % DIFFERENCE BETWEEN THE PRESENT
910 C BILLET STRUCTURE SPECIFIED BY THE USER (T1,T2,S1,S2)
920 C AND THE COMPUTED BILLET STRUCTURES.
930 C IF PERCENT=0.0 THIS OPTION WILL BE IGNORED AND ALL BILLET
940 C STRUCTURES COMPUTED WILL BE PRINTED
950 C IF PERCENT>0.0 ALL BILLET STRUCTURES WITHIN A PLUS OR
960 C MINUS PERCENT OF THE PRESENT STRUCTURE WILL
970 C BE PRINTED
980 C IF PERCENT=-1.0 THE FOLLOWING 8 VARIABLES SUPPLIED BY THE
990 C USER WILL BE UTILIZED
1000 C TIMIN----MINIMUM NUMBER OF FIRST-TERM SEA BILLET
1010 C TIMAX----MAXIMUM NUMBER OF FIRST-TERM SEA BILLET
1020 C T2MIN----MINIMUM NUMBER OF FIRST-TERM SHORE BILLET
1030 C T2MAX----MAXIMUM NUMBER OF FIRST-TERM SHORE BILLET
1040 C S1MIN----MINIMUM NUMBER OF CAREER SEA BILLET
1050 C S1MAX----MAXIMUM NUMBER OF CAREER SEA BILLET
1060 C S2MIN----MINIMUM NUMBER OF CAREER SHORE BILLET
1070 C S2MAX----MAXIMUM NUMBER OF CAREER SHORE BILLET
1080 CC
1090 CCC
1100 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
1110 CCC
1120 CCCC
1130 C DETERMINE WHICH DEFAULT VALUES ARE TO BE USED
1140 CCC
1150 CC
1160 IF (T1T2 .EQ. 0.0) T1T2=T1+T2
1170 IF (T1S1 .EQ. 0.0) T1S1=T1+S1
1180 IF (T2S2 .EQ. 0.0) T2S2=T2+S2
1190 IF (S1S2 .EQ. 0.0) S1S2=S1+S2
1200 IF (A .EQ. 0.0) A=3.
1210 IF (B .EQ. 0.0) B=2.
1220 IF (PERIOD .EQ. 0.0) PERIOD=4.
1230 IF (EPS .EQ. 0.0) EPS=C.0001
1240 IF (SEATIM .EQ. 0.0) SEATIM=PERIOD*2.+1.
1250 IF (SHOTIM .EQ. 0.0) SHOTIM=PERIOD*1.+1.

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1260      IF (PERCEN) 70,EO,90
1270      90  S1MIN=S1*(1.-PERCEN)
1280      S1MAX=S1*(1.+PERCEN)
1290      T1MIN=T1*(1.-PERCEN)
1300      T1MAX=T1*(1.+PERCEN)
1310      T2MIN=T2*(1.-PERCEN)
1320      T2MAX=T2*(1.+PERCEN)
1330      S2MIN=S2*(1.-PERCEN)
1340      S2MAX=S2*(1.+PERCEN)
1350      GO TC 80
1360      70  CONTINUE
1370      IF(T1MAX.EQ.0.) T1MAX=99999999.
1380      IF(T2MAX.EQ.0.) T2MAX=99999999.
1390      IF(S1MAX.EQ.0.) S1MAX=99999999.
1400      IF(S2MAX.EQ.0.) S2MAX=99999999.
1410      80  CONTINUE
1420      CCC
1430      CCC
1440      C   DEFAULT VALUES ARE SET; NOW DETERMINE VALUES TO BE USED
1450      C   IN DC LCOPS AND OTHER COMPLATIONS
1460      CCC
1470      CCC
1480      C2=1.-(1.-C)/PERIOD
1490      C1=F/PERIOD
1500      SEA=A*PERIOD
1510      S+CRE=E*PERIOD
1520      KSEATM=SEATM
1530      KSHOTM=SHOTM
1540      WRITE (20,77) T1,T2,S1,S2,C,R,T1T2,T1S1,T2S2,S1S2,A,B,
1550      *PERIOD,EPS,SEATM,SHOTM,PERCEN,T1MIN,T1MAX,T2MIN,T2MAX,S1MIN,
1560      *S1MAX,S2MIN,S2MAX,ALPHA
1570      77  FORMAT (2X,'PROGRAM PARAMETERS&&  T1=',F9.0,';;  T2=',F9.0,
1580      ';;  S1=',F9.0,';;  S2=',F9.0,';;  C=',F9.5,';;  R=',F9.5
1590      '/7X,'T1T2=',F9.0,';;  T1S1=',F9.0,';;  T2S2=',F9.0,';;'
1600      '  S1S2=',F9.0,';;  A=',F9.3,';;  B=',F9.3/7X,'PERIOD=',
1610      'F9.0,';;  EPS=',F9.5,';;  SEATM=',F9.0,';;  SHOTM=',F9.0,
1620      ';;  PERCEN=',F9.3,';;  T1MIN=',F9.0/7X,'T1MAX=',F9.0,';;  T
1630      '2MIN=',F9.0,';;  T2MAX=',F9.0,';;  S1MIN=',F9.0,';;  S1M
1640      'AX=',F9.0,';;  S2MIN=',F9.0/7X,'S2MAX=',F9.0,';;  ALPHA=',
1650      'F9.0)
1670      IF (ALPHA .EQ. 0.0) GO TO 93
1680      CALL ROTATE (ALPHA)
1690      IF (ALPHA .EQ. 1.0) GO TC 95
1700      93  CALL BALANZ (ALPHA)
1710      95  CONTINUE
1720      ENC
1730      C
1740      C
1750      CCC
1760      CCCC
1770      CCCCCC      END OF MOSES MAIN PROGRAM      CCCCCCCCCCCCCCCCCC
1780      CCCC
1790      CCC
1800      C
1810      C.....
1820      C
1830      CC
1840      SUBROUTINE BALANZ (ALPHA)
1850      COMMON SEA,SHORE,T1Z,T2Z,S1Z,S2Z,PERCEN,IDENT
1860      COMMON /TAL1/ S1MIN,S1MAX,T1MIN,T1MAX,S2MIN,S2MAX
1870      *T2MIN,T2MAX
1880      COMMON /RCT1/ T1,T2,S1,S2,C,R,C1,C2,KSEATM,KSHOTM,PERIOD,EPS,
1890      *T1T2,T1S1,T2S2,S1S2
1900      C

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1910 C THIS SUBROUTINE COMPUTES BALANCED SYSTEMS FOR ALL DESIRED ROTATION
1920 C PATTERNS UNDER EACH OF THE 10 SEPARATE INPUT/OUTPUT GROUPS.
1930 C IDENTICAL COMPUTATIONS AS SUBROUTINE ROTATE3
1940 C ONLY DIFFERENCE IS DISPLAY OF OUTPUT
1950 C
1960 SSS=SHORE
1970 SSEA=SEA
1980 77 FORMAT (1,5X,SEA,3X,SHCRE,17X,TOTAL,5X,TOTAL,19X,
1990 *FIRST,5X,FIRST,35X,7X,FIRST/
2000 *4X,DUTY,3X,DUTY,6X,2X,TOTAL,5X,FIRST,6X,AT,7X,
2010 *TOTAL,9X,TERM,6X,TERM,5X,CAREER,4X,CAREER,8X,
2020 *CAREER,8X,TERM,4X,TCUR,3X,TOUR,7X,CAREER,5X,TERM,7X,
2030 *SEA,5X,ASHORE,9X,SHORE,6X,SEA,7X,SEA,6X,SHORE,
2040 *5X,CONTINUATION,3X,RETENTION//)
2050 88 FCPAT (1X,USER INPLIS ,4X,4F10.0,4X,4F10.0,2X,
2060 *F11.4,F12.4)
2070 IDENT=10
2080 AA=1.-C2
2120 CCCCCCCCCCCCCCCCCCCCCCCCCC
2130 CC
2140 C COMPUTE BALANCED SYSTEM "A":
2150 C
2160 C GIVEN VARIABLES:::::FIRST-TERM SEA BILLETS
2170 C CAREER SEA BILLETS
2180 C CAREER CONTINUATION RATE
2190 C FIRST-TERM RETENTION RATE
2200 C
2210 C SOLUTION VARIABLES::::FIRST-TERM SHORE BILLETS
2220 C CAREER SHORE BILLETS
2230 CC
2240 CCCCCCCCCCCCCCCCCCCCCCCCCC
2250 WRITE (20,77)
2260 WRITE (20,88) S1S2,T1T2,T1S1,T2S2,T2T1,S1S2,C,R
2270 CO 101 JJJ=1,KSEATM
2280 ASEA=C2+SEA
2290 AB=1.-ASEA
2300 CC 100 III=1,KSHOTM
2310 ASHOR=C2+SHORE
2320 AC=1.-ASHOR
2330 BX=1.-C2+(SEA+SHORE)
2340 T2Z=-ASHOR*T1+BX*AA+S1/(C1+AB)
2350 S2Z=C1*T1+AC/AA+ASEA+S1+AC/AB
2360 T1Z=T1
2370 S1Z=S1
2380 CALL PRINTT (C,R)
2390 SHORE=SHCRE+1.
2400 100 CONTINUE
2410 SEA=SEA+1.
2420 SHORE=SSH
2430 101 CONTINUE
2440 SEA=SSEA
2450 WRITE (20,133)
2460 WRITE (20,144)
2470 WRITE (20,155)
2480 133 FORMAT (//2),GIVEN: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS,
2490 * CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE)
2500 144 FORMAT(//3C),..... THEN FOR THE VARIOUS ROTATION PATTERNS *
2510 * ABOVE.....AND A BALANCED SYSTEM//)
2520 155 FORMAT (2X,SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER*
2530 * SHCRE BILLETS)
2540 CCCCCCCCCCCCCCCCCCCCCCCCCC
2550 CC
2560 C COMPUTE BALANCED SYSTEM "B":
2570 C

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2580 C GIVEN VARIABLES::::: CAREER SHORE BILLETS
2590 C CAREER SEA BILLETS
2600 C CAREER CONTINLATION RATE
2610 C FIRST-TERM RETENTION RATE
2620 C
2630 C SOLUTION VARIABLES:::: FIRST-TERM SHORE BILLETS
2640 C FIRST-TERM SEA BILLETS
2650 CC
2660 CCCCCCCCCCCCCCCCCCCCCC
2670 WRITE (20,77)
2680 WRITE (20,88) S1S2, T1T2, T1S1, T2S2, T2, T1, S1, S2, C, R
2690 DO 202 JJJ=1, KSEATN
2700 ASEA=C2**SEA
2710 AE=1.-ASEA
2720 DO 200 III=1, KSHDTN
2730 AC=1.-C2**SHORE
2740 T1Z=(S2-ASEA*AC/AB*S1)/C1*AA/AC
2750 T2Z=S1S2*AA/C1-T1Z
2760 S2Z=S2
2770 S1Z=S1
2780 CALL PRINT (C, R)
2790 SHORE=SHORE+1.
2800 200 CONTINUE
2810 SEA=SEA+1.
2820 SHORE=SSH
2830 202 CONTINUE
2840 SEA=SSEA
2850 WRITE (20,233)
2860 WRITE (20,144)
2870 WRITE (20,255)
2880 233 FORMAT (//2X, 'GIVEN: CAREER SEA BILLETS, CAREER SHORE BILLETS,
2890 * CAREER CONTINLATION RATE AND FIRST-TERM RETENTION RATE')
2900 255 FORMAT (2X, 'SOLVE FOR: FIRST-TERM SHORE BILLETS AND '
2910 * FIRST-TERM SEA BILLETS')
2920 CCCCCCCCCCCCCCCCCCCCCC
2930 CC
2940 C COMPUTE BALANCED SYSTEM "C":
2950 C
2960 C GIVEN VARIABLES::::: FIRST-TERM SEA BILLETS
2970 C FIRST-TERM SHORE BILLETS
2980 C CAREER CONTINLATION RATE
2990 C FIRST-TERM RETENTION RATE
3000 C
3010 C SOLUTION VARIABLES:::: CAREER SEA BILLETS
3020 C CAREER SHORE BILLETS
3030 CC
3040 CCCCCCCCCCCCCCCCCCCCCC
3050 WRITE (20,77)
3060 WRITE (20,88) S1S2, T1T2, T1S1, T2S2, T2, T1, S1, S2, C, R
3070 DO 303 JJJ=1, KSEATN
3080 AB=1.-C2**SEA
3090 DO 300 III=1, KSHDTN
3100 ASHOR=C2**SHORE
3110 BX=1.-C2** (SEA*SHORE)
3120 S1Z=C1*AB*(T2*ASHOR*T1)/(CX*AA)
3130 S2Z=T1T2*C1/AA-S1Z
3140 T2Z=T2
3150 T1Z=T1
3160 CALL PRINT (C, R)
3170 SHORE=SHORE+1.
3180 300 CONTINUE
3190 SEA=SEA+1.
3200 SHORE=SSH
3210 303 CONTINUE

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3220      SEA=SSEA
3230      WRITE (20,333)
3240      WRITE (20,144)
3250      WRITE (20,355)
3260      333   FORMAT (/2X,'GIVEN: FIRST-TERM SHORE BILLETS, FIRST-
3270      *TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM
3280      *RETENTION RATE')
3290      355   FORMAT (2X,'SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE
3300      *BILLETS')
3310      CCCCCCCCCCCCCCCCCCCCCCCCCC
3320      CC
3330      C   COMPUTE BALANCED SYSTEM "D":
3340      C
3350      C   GIVEN VARIABLES:::::FIRST-TERM SHORE BILLETS
3360      C                               TOTAL SEA BILLETS
3370      C                               CAREER CONTINUATION RATE
3380      C                               FIRST-TERM RETENTION RATE
3390      C
3400      C   SOLUTION VARIABLES:::CAREER SEA BILLETS
3410      C                               CAREER SHORE BILLETS
3420      C                               FIRST-TERM SEA BILLETS
3430      CC
3440      CCCCCCCCCCCCCCCCCCCCCCCCCC
3450      WRITE (20,77)
3460      WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
3470      CC 5G5 JJJ=1,KSEATH
3480      AB=1.-C2+SEA
3490      DO 5CC III=1,KSHOTM
3500      #SHOF=C2+SHORE
3510      BX=1.-C2+(SEA+SHORE)
3520      S1Z=(T1S1+#SHOF+T2)/(ASHOF+(AA+BX)/(C1+AB))
3530      T1Z=T1S1-S1Z
3540      S2Z=(T2+T1Z)+C1/AA-S1Z
3550      T2Z=T2
3560      CALL PRINTT (C,R)
3570      SHORE=SHORE+1.
3580      500   CONTINUE
3590      SEA=SEA+1.
3600      SHORE=SSH
3610      505   CCNTINUE
3620      SEA=SSEA
3630      WRITE (20,333)
3640      WRITE (20,144)
3650      WRITE (20,355)
3660      533   FORMAT(/2X,'GIVEN: FIRST-TERM SHORE BILLETS, TOTAL SEA BILLETS'
3670      *', CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE')
3680      555   FORMAT (2X,'SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA
3690      *BILLETS AND CAREER SHORE BILLETS')
3700      CCCCCCCCCCCCCCCCCCCCCCCCCC
3710      CC
3720      C   COMPUTE BALANCED SYSTEM "E":
3730      C
3740      C   GIVEN VARIABLES:::::FIRST-TERM SHORE BILLETS EQUAL ZERO
3750      C                               TOTAL SEA BILLETS
3760      C                               CAREER CONTINUATION RATE
3770      C                               FIRST-TERM RETENTION RATE
3780      C
3790      C   SOLUTION VARIABLES:::CAREER SEA BILLETS
3800      C                               CAREER SHORE BILLETS
3810      C                               FIRST-TERM SEA BILLETS
3820      CC
3830      CCCCCCCCCCCCCCCCCCCCCCCCCC
3840      WRITE (20,77)
3850      WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R

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3860      T24=0.
3870      DO ECE JJJ=1,KSEATM
3880      A3=1.-C2**SEA
3890      DO EOO III=1,KSHOTM
3900      ASHCF=C2**SHORE
3910      BX=1.-C2** (SEA*SHORE)
3920      S1Z=(T1S1*ASHOR+T2Z)/(ASHOR*(AA*9X)/(C1*AB))
3930      T1Z=T1S1-S1Z
3940      S2Z=(T2Z+T1Z)*C1/AA-S1Z
3950      CALL PRINTT (C,R)
3960      SHCRE=SHORE*1.
3970      CONTINUE
3980      SEA=SEA*1.
3990      SHORE=SSH
4000      606  CONTINUE
4010      SEA=SSEA
4020      WRITE (20,633)
4030      WRITE (20,144)
4040      WRITE (20,555)
4050      633  FORMAT (//2X,'GIVEN: FIRST-TERM SHORE BILLETS EQUAL TO ZERO,'
4060      '* TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM '
4070      '**RETENTICA RATE*')
4080      CCCCCCCCCCCCCCCCCCCCCCCCCC
4090      CC
4100      C  COMPUTE BALANCED SYSTEM "F":
4110      C
4120      C  GIVEN VARIABLES:::::TOTAL SHORE BILLETS
4130      C  TOTAL SEA BILLETS
4140      C  CAREER CONTINUATION RATE
4150      C  FIRST-TERM RETENTION RATE
4160      C
4170      C  SOLUTION VARIABLES:::CAREER SEA BILLETS
4180      C  CAREER SHORE BILLETS
4190      C  FIRST-TERM SEA BILLETS
4200      C  FIRST-TERM SHORE BILLETS
4210      CC
4220      CCCCCCCCCCCCCCCCCCCCCCCCCC
4230      WRITE (20,77)
4240      WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
4250      DO 707 JJJ=1,KSEATM
4260      AB=1.-C2**SEA
4270      DO 700 III=1,KSHOTM
4280      ASHOR=C2**SHORE
4290      AC=1.-ASHOR
4300      BX=1.-C2** (SEA*SHORE)
4310      XXY=BX/C1*AA/AB
4320      YYX=(T1S1+T2S2)*AA/(C1*AA)
4330      T2Z=(XXY*(T1S1-YYX)-ASHCF*YYX)/(AC-XXY)
4340      S2Z=T2S2-T2Z
4350      T1Z=YYX-T2Z
4360      S1Z=T1S1-T1Z
4370      CALL PRINTT (C,R)
4380      SHORE=SHORE*1.
4390      700  CONTINUE
4400      SEA=SEA*1.
4410      SHORE=SSH
4420      707  CONTINUE
4430      SEA=SSEA
4440      WRITE (20,733)
4450      WRITE (20,144)
4460      WRITE (20,755)
4470      733  FORMAT (//2X,'GIVEN: TOTAL SEA BILLETS, TOTAL SHORE BILLETS, '
4480      '* CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE*')
4490      755  FORMAT (2X,'SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM '

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4500      **SEA BILLETS, CAREER SHCRE BILLETS AND CAREER SEA BILLETS**
4510      CCCCCCCCCCCCCCCCCCCCCCCCCC
4520      CC
4530      C   COMPUTE BALANCED SYSTEM "G":
4540      C
4550      C   GIVEN VARIABLES:::::CAREER SEA BILLETS
4560      C                       TOTAL FIRST-TERM BILLETS
4570      C                       CAREER CONTINATION RATE
4580      C                       FIRST-TERM RETENTION RATE
4590      C
4600      C   SOLUTION VARIABLES:::CAREER SHORE BILLETS
4610      C                       FIRST-TERM SHORE BILLETS
4620      C                       FIRST-TERM SEA BILLETS
4630      CC
4640      CCCCCCCCCCCCCCCCCCCCCCCCCC
4650      C   WRITE (20,77)
4660      C   WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
4670      C   DO 808 JJJ=1,KSEATM
4680      C   AB=1.-C2**SEA
4690      C   CC 800 III=1,FSHOTM
4700      C   ASHOR=C2**SHORE
4710      C   AC=1.-ASHOR
4720      C   BX=1.-C2**C(SEA+SHORE)
4730      C   S2Z=T1T2/AA*C1-S1
4740      C   T2Z=-ASHOR*T1T2/AC+BX/C1-AA/AB*S1/AC
4750      C   T1Z=T1T2-T2Z
4760      C   S1Z=S1
4770      C   CALL PRINTT (C,R)
4780      C   SHCRE=SHORE+1.
4790      C   800   CONTINUE
4800      C   SEA=SEA+1.
4810      C   SHORE=SSH
4820      C   808   CONTINUE
4830      C   SEA=SSEA
4840      C   WRITE (20,833)
4850      C   WRITE (20,144)
4860      C   WRITE (20,155)
4870      C   833   FORMAT (/2X,*,GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM *
4880      C   *BILLETS, CAREER CONTINATION RATE AND FIRST-TERM *
4890      C   ** RETENTION RATE*)
4900      C   855   FORMAT (2X,*,SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-
4910      C   *TERM SEA BILLETS AND CAREER SHORE BILLETS*)
4920      CCCCCCCCCCCCCCCCCCCCCCCCCC
4930      CC
4940      C   COMPUTE BALANCED SYSTEM "H":
4950      C
4960      C   GIVEN VARIABLES:::::FIRST-TERM SEA BILLETS
4970      C                       FIRST-TERM SHORE BILLETS
4980      C                       CAREER SEA BILLETS
4990      C                       CAREER CONTINATION RATE
5000      C
5010      C   SOLUTION VARIABLES:::FIRST-TERM RETENTION RATE
5020      C                       CAREER SHORE BILLETS
5030      CC
5040      CCCCCCCCCCCCCCCCCCCCCCCCCC
5050      C   TTT=T1+T2
5060      C   IF (TTT .LT. 1.0) GO TO 1025
5070      C   WRITE (20,77)
5080      C   WRITE (20,88)  S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
5090      C   DO 909 JJJ=1,KSEATM
5100      C   AB=1.-C2**SEA
5110      C   CC 900 III=1,FSHOTM
5120      C   ASHOR=C2**SHORE
5130      C   BX=1.-C2**C(SEA+SHORE)

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5140      C11=C1
5150      C1=EX*AA/AR*S1/(T2+ASHOR*11)
5160      S22=T1T2*C1/AA-S1
5170      T12=T1
5180      T22=T2
5190      S17=S1
5200      RRR=R
5210      R=C1*PEFICC
5220      CALL PRINTT (C,R)
5230      C      CALL CPECH
5240      R=RRR
5250      C1=C11
5260      SHORE=SHORE+1.
5270      900      CONTINUE
5280      SEA=SEA+1.
5290      SHORE=SSH
5300      909      CONTINUE
5310      SEA=SSEA
5320      WRITE (20,933)
5330      WRITE (20,144)
5340      WRITE (20,955)
5350      933      FORMAT (//2X,'GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM*
5360      ** SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION*
5370      ** RATE*')
5380      955      FORMAT (2X,'SOLVE FOR: CAREER SHORE BILLETS AND FIRST-
5390      **TERM RETENTION RATE*')
5400      CCCCCCCCCCCCCCCCCCCCCCCCCC
5410      CC
5420      C      COMPUTE BALANCED SYSTEM "I":
5430      C
5440      C      GIVEN VARIABLES:::::FIRST-TERM SEA BILLETS
5450      C      FIRST-TERM SHORE BILLETS
5460      C      CAREER SEA BILLETS
5470      C      FIRST-TERM RETENTION RATE
5480      C
5490      C      SOLUTION VARIABLES:::CAREER CONTINUATION RATE
5500      C      CAREER SHORE BILLETS
5510      CC
5520      CCCCCCCCCCCCCCCCCCCCCCCCCC
5530      IF (S1 .LT. 1.0) GO TO 1025
5540      WRITE (20,77)
5550      WRITE (20,88) S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
5560      GOAL=C1/S1
5570      DIF=GOAL*EPS
5580      AAA=.2
5590      Z=C.99999
5600      CO 1C2C JJJ=1-KSEATH
5610      OD 1010 III=1-KSHOTM
5620      ICOUNT=C
5630      C22=AAA
5640      B=(1.-C22***(SEA+SHORE))*(1.-C22)
5650      E=B/(T2+T1*C22**SHORE)*(1.-C22**SEA)
5660      IF (E .GT. GOAL) GO TO 1000
5670      XMIN=AAA
5680      XMAX=2
5690      GO TO 1002
5700      1000      XMIN=Z
5710      XMAX=AAA
5720      1002      CONTINUE
5730      C22=(XMAX+XMIN)/2.
5740      C22=ABS(C22)
5750      B=(1.-C22***(SEA+SHORE))*(1.-C22)
5760      E=B/(T2+T1*C22**SHORE)*(1.-C22**SEA)
5770      G1=ABS(GOAL-B)

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5780      IF (G1.LE.C1F) GO TO 1005
5790      IF (B.GT. GCAL) XMAX=C2Z
5800      IF (B .LT. GOAL) XMIN=C2Z
5810      ICOUNT=ICOUNT+1
5820      IF (ICOUNT .GE. 30) WRITE (20,1022)
5830      IF (ICOUNT .GE. 30) GO TO 1005
5840      GO TO 1002
5850 1005      CONTINUE
5860      CCC=C
5870      C=1.-((1.-C2Z)*PERIOD)
5880      S2Z=(C1+T1)*(1.-C2Z**SHORE)/(1.-C2Z)
5890      S2Z=S2Z+C2Z**SEA*S1*(1.-C2Z**SHORE)/(1.-C2Z**SEA)
5900      T1Z=T1
5910      T2Z=T2
5920      S1Z=S1
5930      C2Z=C2
5940      C2=C2Z
5950      CALL PRINTT (C,R)
5960  C      CALL CFECH
5970      C2=C2Z
5980      C=CCC
5990      SHORE=SHORE+1.
6000 1010      CONTINUE
6010      SEA=SEA+1.
6020      SHORE=SHORE
6030 1020      CONTINUE
6040      SEA=SSEA
6050 1022      FORMAT (/2X,'CONTINUATION EVALUATED MORE THAN 30 TIMES FOR '
6060      **THE FOLLOWING ROTATION PATTERN WITH NO CONVERGENCE**')
6070      WRITE (20,1033)
6080      WRITE (20,144)
6090      WRITE (20,1055)
6100      GO TO 1099
6110 1025      WRITE (20,1066)
6120 1033      FORMAT (/2X,'GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM'
6130      ** SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION'
6140      ** RATE')
6150 1035      FORMAT (2X,'SOLVE FOR: CAREER SHORE BILLETS AND CAREER '
6160      **CONTINUATION RATE')
6170 1066      FORMAT ('1',3X,'NO SOLUTIONS FOR THE VARIABLE CONTINUATION '
6180      **RATES DUE TO LACK OF NON-ZERO INPUTS')
6190 1099      CONTINUE
6200  CC
6210  CCCCCCCCCCCCCCCCCCCCCCCCCC
6220  CC
6230  C      COMPUTE BALANCED SYSTEM "J":
6240  C
6250  C      GIVEN VARIABLES:::::FIRST-TERM SEA BILLETS
6260  C                          FIRST-TERM SHORE BILLETS
6270  C                          CAREER SEA BILLETS
6280  C                          CAREER SHORE BILLETS
6290  C
6300  C      SOLUTION VARIABLES:::CAREER CONTINUATION RATE
6310  C                          FIRST-TERM RETENTION RATE
6320  CC
6330  CCCCCCCCCCCCCCCCCCCCCCCCCC
6340      IF ((S1+S2) .LT. 1.0) GO TO 1125
6350      IF ((T1+T2) .LT. 1.0) GO TO 1125
6360      WRITE (20,77)
6370      WRITE (20,88) S1S2,T1T2,T1S1,T2S2,T2T1,S1,S2,C,R
6375      EPS=EPS
6377      EPS=EPS+.1
6380      GOAL=(T1/S2)*((S1+S2)/(T1+T2))
6390      DIF=GOAL-EPS

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6400      AAA=-2
6410      Z=C.99999
6420      CO 1120 JJJ=1,KSEATH
6430      DO 1111 III=1,KSHOTP
6440      ICCUNT=0
6450      C22=AAA
6460      B=1/(1.-C22**SHORE)-(S1*C22**SEA)/(S2*(1-C22**SEA))
6470      IF (B .GT. GOAL) GO TO 1100
6480      XMIN=AAA
6490      XMAX=Z
6500      GO TO 1102
6510 1100   XMIN=Z
6520      XMAX=AAA
6530 1102   CONTINUE
6540      C22=(XMAX+XMIN)/2.
6550      B=1/(1.-C22**SHORE)-(S1*C22**SEA)/(S2*(1-C22**SEA))
6560      G1=ABS(GOAL-B)
6570      IF(G1.LE.01F) GO TO 1105
6580      IF (E.GT. GOAL) XMAX=C22
6590      IF (B .LT. GOAL) XMIN=C22
6600      ICCUNT=ICCUNT+1
6610      IF (ICCUNT .LT. 30) GO TO 1102
6620      IF (PERCENT .NE. 0.C) GO TO 1110
6640 1105   CONTINUE
6650      CCC=C
6660      C=1.-((1.-C22)*PERIOD)
6670      RZ=C1
6680      C1=(1.-C22)*(S1+S2)/(T1+T2)
6690      T1Z=T1
6700      T2Z=T2
6710      S1Z=S1
6720      S2Z=S2
6730      C2Z=C2
6740      C2=C2Z
6750      RR=R
6760      F=C1*PERIOD
6762      IF (ICCUNT .LT. 30) GO TO 1108
6764      WRITE (20,1144) IDENT,SEA,SHORE,T2Z,T1Z,S1Z,S2Z,C,R
6768      GO TO 1109
6770 1108   CALL PFINTT (C,R)
6775 1109   CONTINUE
6780 C      CALL CHECK
6790      C1=RZ
6800      C=CCC
6810      C2=C2Z
6820      R=RR
6825 1110   CONTINUE
6830      SHORE=SHORE+1.
6840 1111   CONTINUE
6850      SEA=SEA+1.
6860      SHORE=SSH
6870 1120   CONTINUE
6880      SEA=SSEA
6910      WRITE (20,1133)
6920      WRITE (20,144)
6930      WRITE (20,1155)
6935      EPS=DEPS
6940      RETURA
6950 1125   WRITE (20,1166)
6960 1133   FORMAT (//2X,'GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM'
6970      *' SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS')
6972 1144   FORMAT(1X,A1,F6.0,F7.0,14X,'NO FEASIBLE SOLUTION',14X,4F10.0,2X,
6974      *F11.4,F13.4)
6980 1155   FORMAT (2X,'SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER *

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6990      **CONTINUATION RATE**
7000      1166  FORMAT ('1',3X,'NO SOLUTIONS FOR THE VARIABLE CONTINUATION '
7010      *RATES DUE TO LACK OF NON-ZERO INPUTS')
7020      RETURN
7030      END
7040      CCCC
7050      CCCCCC      ENC OF BALAN2 SUBROUTINE      CCCCCCCCCCCCCCCC
7060      CCCC
7070      CC
7080      C
7090      C.....L
7100      C
7110      C
7120      C
7130      SUBROUTINE PRINT1 (C,R)
7140      COMMON SEA,SHORE,T12,T22,S12,S22,PERCEN,IDENT
7150      CC
7160      CCCCCCCCCC
7170      C THIS SUBROUTINE PROVIDES THE PRINTED OUTPUT FOR THE MODEL AFTER
7180      C AGGREGATE THE FOUR BASIC BILLET GROUPS T1,T2,S1,S2 TO FORM THE TOTAL
7190      C CAREER, TOTAL FIRST-TERM, TOTAL SEA AND TOTAL SHORE BILLET GROUPINGS
7200      CCCCCCCCCC
7210      CC
7220      C      CALL CHECK
7230      C      KT1=T12*0.5
7240      C      KT2=T22*0.5
7250      C      KS1=S12*0.5
7260      C      KS2=S22*0.5
7270      C      S1S22=FLOAT (KS1+KS2)
7280      C      T1T22= FLOAT (KT1+KT2)
7290      C      T1S12= FLOAT (KT1+KS1)
7300      C      T2S22= FLOAT (KT2+KS2)
7310      C      TEST=0.0
7320      CCCC
7330      CC
7340      C DETERMINE IF ALL BILLET STRUCTURES ARE TO BE PRINTED OR ONLY THOSE
7350      C WITHIN FEASIBLE BOUNDS
7360      CC
7370      CCCC
7380      C      IF (PERCEN .EQ. 0.0) GO TO 2000
7390      C      CALL FEASBL (TEST)
7400      C      IF (TEST .EQ. 0.0) RETURN
7410      C      2000  WRITE (20,2020) IDENT,SEA,SHORE,S1S22,T1T22,T1S12,T2S22,
7420      C      *T22,T12,S12,S22,C,R
7430      C      2020  FORMAT(1X,A1,F6.0,F7.0,4X,4F10.0,4X,4F10.0,2X,F11.4,F13.4)
7440      C      RETURN
7450      C      END
7460      CCC
7470      CCC
7480      CCC
7490      C
7500      C
7510      C.....L
7520      C
7530      C
7540      C
7550      SUBROUTINE FEASBL (TEST)
7560      COMMON SEA,SHORE,T12,T22,S12,S22,PERCEN,IDENT
7570      COMMON /TALI/ S1MIN,S1MAX,T1MIN,T1MAX,S2MIN,S2MAX
7580      *T2MIN,T2MAX)
7590      CCC
7600      CCCCCCCCCCCCCC
7610      C AN OPTIONAL SUBROUTINE THAT DETERMINES WHICH BILLET STRUCTURES
7620      C ARE WITHIN THE FEASIBLE LIMITS SET BY THE USER

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7630      CCCCCCCCCCCCCC
7640      CCC
7650          IF (S1Z .LT. S1MIN) RETURN
7660          IF (S1Z .GT. S1MAX) RETURN
7670          IF (T1Z .LT. T1MIN) RETURN
7680          IF (T1Z .GT. T1MAX) RETURN
7690          IF (T2Z .LT. T2MIN) RETURN
7700          IF (T2Z .GT. T2MAX) RETURN
7710          IF (S2Z .LT. S2MIN) RETURN
7720          IF (S2Z .GT. S2MAX) RETURN
7730          TEST = 1.0
7740          RETURN
7750          END
7760      CCC
7770      CCC
7780      CCC
7790      C.....
7800      C
7810      C
7820      C
7830          SUBROUTINE CHECK
7840          COMMON SEA,SHORE,T1Z,T2Z,S1Z,S2Z,PERCEN,IDENT
7850          COMMON /ROT1/ T1,T2,S1,S2,C,R,C1,C2,KSEATH,XSHOTN,PERIOD,EPS,
7860          *T1Z,T1S1,T2S2,S1S2
7870      CCC
7880      CCC
7890      CCCCCCCCCCCCCC
7900      C THIS SUBROUTINE, IF CALLED, WILL CHECK A BILLET STRUCTURE FOR
7910      C BALANCE. IT WILL DETERMINE AND PRINT THE NUMBER OF GAINS FROM
7920      C THE FIRST-TERTERS TO THE CAREER FORCE AND THE NUMBER OF LOSSES
7930      C FROM THE CAREER FORCE FOR EACH PERIOD. IT WILL ALSO DETERMINE
7940      C THE GAINS TO AND LOSSES FROM THE CAREER SEA FORCE FOR EACH
7950      C PERIOD.
7960      CC
7970      C ANYTIME THE USER ADDS A NEW BILLET STRUCTURE COMPUTATION THIS
7980      C SUBROUTINE CAN BE UTILIZED TO CHECK FOR A BALANCED SYSTEM
7990      C AND CORRECT COMPUTER PROGRAMING.
8000      CC
8010      CCC
8020      CCCCCCCCCCCCCCCCCC
8030      CC
8040          WRITE (20,4044)
8050          WRITE (20,4055) T1Z,T2Z,S1Z,S2Z,C,R,SEA,SHORE
8060      4044      FORMAT (/10X,'SUBROUTINE CHECK'/)
8070      4055      FORMAT (10X,'T1 IS ',F8.0,5X,'T2 IS ',F8.0,5X,
8080          *S1 IS ',F8.0,5X,'S2 IS ',F8.0/10X,'C IS ',F10.6,5X,
8090          *R IS ',F10.6,5X,'A IS ',F4.0,5X,'B IS ',F4.0)
8100          X=(1.-C2)*(S1Z+S2Z)
8110          Y=(T1Z+T2Z)*C1
8120          WRITE (20,4066) X,Y
8130      4066      FCRPAT (/7X,'TOTAL CAREER LOSSES ARE ',F6.0/9X,'TOTAL CAREER'
8140          *GAINS ARE ',F6.0)
8150          CNN=(S1Z*(1.-C2))/(1.-C2**SEA)
8160      4077      FORMAT (10X,'CAREER SEA GAINS ARE ',F6.0/9X,
8170          *CAREER SEA LOSSES ARE ',F6.0)
8180          CNN=CNN+C2**SEA
8190          CNN=CNN+S1Z*(1.-C2)
8200          CNNEN=((S2Z*(1.-C2))/(1.-C2**SHORE))*C2**SHORE +T2Z*C1
8210          WRITE (20,4077) CNN,CNNEN
8220          RETURN
8230          END
8240      C
8250      C
8260      C

```

```

0270 C
0280 C.....
0290 C
0300 C
0310 C
0320 SUBROUTINE ROTATE (ALPHA)
0330 COMMON SEA,SHORE,T12,T22,S12,S22,PERCENT,IDENT
0340 COMMON /TAL1/ S1MIN,S1MAX,T1MIN,T1MAX,S2MIN,S2MAX
0350 *T2MIN,T2MAX
0360 COMMON /RCF1/ T1,T2,S1,S2,C,R,C1,C2,KSEATH,KSHOTN,PERIOD,EPS,
0370 *T1T2,T1S1,T2S2,S1S2
0380 C
0390 C THIS SUBROUTINE COMPUTES BALANCED SYSTEMS FOR ALL 10 INPUT/OUTPUT
0400 C STRUCTURES FOR EACH OF THE DESIRED ROTATION PATTERNS
0410 C IDENTICAL COMPUTATIONS AS SUBROUTINE BALANZ
0420 C ONLY DIFFERENCE IS DISPLAY OF OUTPUT
0430 103 FORMAT ('1',5X,'SEA',3X,'SHORE',17X,'TOTAL',5X,'TOTAL',19X,
0440 *'FIRST',5X,'FIRST',35X,7X,'FIRST'/
0450 *4X,'DUTY',3X,'DUTY',6X,2X,'TOTAL',5X,'FIRST',6X,'AT',7X,
0460 *'TOTAL',5X,'TERM',6X,'TERM',5X,'CAREER',4X,'CAREER',8X,
0470 *'CAREER',8X,'TERM',4X,'TCUR',3X,'TOUR',7X,'CAREER',5X,'TERM',7X,
0480 *'SEA',5X,'ASHORE',9X,'SHORE',6X,'SEA',7X,'SEA',6X,'SHORE',
0490 *5X,'CONTINUATION',3X,'RETENTION'//)
0500 115 FORMAT (1X,'USER INPUTS ',4X,4F10.0,4X,4F10.0,2X,
0510 *F11.4,F11.4)
0520 WRITE (20,122)
0530 WRITE (20,133)
0540 WRITE (20,155)
0550 WRITE (20,233)
0560 WRITE (20,255)
0570 WRITE (20,333)
0580 WRITE (20,355)
0610 WRITE (20,533)
0620 WRITE (20,555)
0630 WRITE (20,633)
0640 WRITE (20,555)
0650 WRITE (20,733)
0660 WRITE (20,755)
0670 WRITE (20,833)
0680 WRITE (20,855)
0690 WRITE (20,933)
0700 WRITE (20,955)
0710 WRITE (20,1033)
0720 WRITE (20,1055)
0725 WRITE (20,1133)
0727 WRITE (20,1155)
0730 122 FORMAT (//15X,'SUMMARY OF INPUT AND OUTPUT VARIABLES FOR'
0740 *' LINES A-J ARE:')
0750 133 FORMAT (//2X,'A GIVEN: FIRST-TERM SEA BILLETS, CAREER SEA '
0760 *'BILLETS,CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION '
0770 *'RATE')
0780 155 FORMAT (6X,'SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER'
0790 *' SHORE BILLETS')
0800 233 FORMAT (//2X,'B GIVEN: CAREER SEA BILLETS, CAREER SHORE BILL'
0810 *'ETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE')
0820 255 FORMAT (6X,'SOLVE FOR: FIRST-TERM SHORE BILLETS AND '
0830 *'FIRST-TERM SEA BILLETS')
0840 333 FORMAT (//2X,'C GIVEN: FIRST-TERM SHORE BILLETS, FIRST-'
0850 *'TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM'
0860 *' RETENTION RATE')
0870 355 FORMAT (6X,'SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE'
0880 *' BILLETS')
0930 533 FORMAT(//2X,'D GIVEN: FIRST-TERM SHORE BILLETS, TOTAL SEA BILL'
0940 *'ETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE')

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8950 555 FORMAT (6X,'SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA
8960 ** BILLETS AND CAREER SHORE BILLETS')
8970 633 FORMAT (//2X,'E GIVEN: FIRST TERM SHORE BILLETS EQUAL TO ZERO
8980 **D, TOTAL SEA BILLETS, CAREER CONTINLATION RATE AND FIRST-TERM
8990 **RETENTION RATE')
9000 733 FORMAT (//2X,'F GIVEN: TOTAL SEA BILLETS, TOTAL SHORE BILLET
9010 **S, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE')
9020 755 FORMAT (6X,'SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM
9030 **SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS')
9040 833 FORMAT (//2X,'G GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM
9050 **BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM
9060 ** RETENTION RATE')
9070 855 FORMAT (6X,'SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-
9080 **TERM SEA BILLETS AND CAREER SHORE BILLETS')
9090 933 FORMAT (//2X,'H GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM
9100 ** SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION
9110 ** RATE')
9120 955 FORMAT (6X,'SOLVE FOR: CAREER SHORE BILLETS AND FIRST-
9130 **TERM RETENTION RATE')
9140 1033 FORMAT (//2X,'I GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM
9150 ** SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION
9160 ** RATE')
9170 1055 FORMAT (6X,'SOLVE FOR: CAREER SHORE BILLETS AND CAREER
9180 **CONTINUATION RATE')
9181 1133 FORMAT (//2X,'J GIVEN: FIRST-TERM SHORE BILLETS, FIRST-TERM
9182 ** SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS')
9184 1155 FORMAT (6X,'SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER
9185 **CONTINUATION RATE')
9190 CCCCCCCCCCCCCC
9200 CCCCCCCCCCCCCC COMPUTATIONS BEGIN HERE
9210 CCCCCCCCCCCCCC
9220 SSEA=SEA
9230 SSH=SHORE
9240 AA=1.-C2
9250 IS=C
9270 DO 999 JJJ=1,KSEATH
9280 ASEA=C2**SEA
9290 AE=1.-ASEA
9300 DO 998 III=1,KSHOTM
9320 IS=IS+1
9330 IO=IS/5
9340 IF (IO .EQ. 1) IS=1
9350 IF (IS .EQ. 1) WRITE (20,103)
9360 WRITE (20,115) S1S2,T1T2,T1S1,T2S2,T2,T1,S1,S2,C,R
9370 193 CONTINUE
9380 ASHOR=C2**SHORE
9390 AC=1.-ASHOR
9400 BX=1.-C2** (SEA+SHORE)
9410 C
9420 C BALANCED STRUCTURE "A":
9430 C GIVEN: T1,S1,C,R
9440 C SOLVE FOR: T2,S2
9450 C
9460 T22=-ASHOR*T1+BX*AA*S1/(C1*AB)
9470 S27=C1*T1+AC/AA+ASEA*S1+AC/AB
9480 T12=T1
9490 S12=S1
9500 ICENT=1+I
9510 CALL PRINT (C,R)
9520 C
9530 C BALANCED STRUCTURE "B":
9540 C GIVEN: S1,S2,C,R
9550 C SOLVE FOR: T1,T2
9560 C

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9570      T1Z=(S2-ASEA*AC/AB*S1)/C1*AA/AC
9580      T2Z=S1S2*AA/C1-T1Z
9590      S2Z=S2
9600      S1Z=S1
9610      IDENT=1PE
9620      CALL PRINTT (C,R)
9630      C
9640      C BALANCED STRUCTURE "C":
9650      C GIVEN:      T1,T2,C,R
9660      C SOLVE FOR:  S1,S2
9670      C
9680      S1Z=C1*AB*(T2*ASHOR*T1)/(CX*AA)
9690      S2Z=T1T2*C1/AA-S1Z
9700      T2Z=T2
9710      T1Z=T1
9720      IDENT=1PC
9730      CALL PRINTT (C,R)
9740      C
9750      C BALANCED STRUCTURE "D":
9760      C GIVEN:      T2,T1S1,C,R
9770      C SOLVE FOR:  T1,S1,S2
9780      C
9790      S1Z=(T1S1*ASHOR*T2)/(ASHOR*(AA*BX)/(C1*AB))
9800      T1Z=T1S1-S1Z
9810      S2Z=(T2+T1Z)*C1/AA-S1Z
9820      T2Z=T2
9830      IDENT=1HD
9840      CALL PRINTT (C,R)
9850      C
9860      C BALANCED STRUCTURE "E":
9870      C GIVEN:      T2=0.,T1S1,C,R
9880      C SOLVE FOR:  T1,S1,S2
9890      C
9900      T2Z=0.
9910      S1Z=(T1S1*ASHOR+T2Z)/(ASHOR*(AA*BX)/(C1*AB))
9920      T1Z=T1S1-S1Z
9930      S2Z=(T2Z+T1Z)*C1/AA-S1Z
9940      IDENT=1PE
9950      CALL PRINTT (C,R)
9960      C
9970      C BALANCED STRUCTURE "F":
9980      C GIVEN:      T1S1,T2S2,C,R
9990      C SOLVE FOR:  T1,T2,S1,S2
10000     C
10010     XXV=BX/C1*AA/AB
10020     YYX=(T1S1+T2S2)*AA/(C1*AA)
10030     T2Z=(XXV*(T1S1-YYX)-ASHOR*YYX)/(AC-XXV)
10040     S2Z=T2S2-T2Z
10050     T1Z=YYX-T2Z
10060     S1Z=T1S1-T1Z
10070     IDENT=1HF
10080     CALL PRINTT (C,R)
10090     C
10100     C BALANCED STRUCTURE "G":
10110     C GIVEN:      S1,T1T2,C,R
10120     C SOLVE FOR:  T1,T2,S2
10130     C
10140     S2Z=T1T2/AA-C1-S1
10150     T2Z=-ASHOR*T1T2/AC*BX/C1*AA/AB-S1/AC
10160     T1Z=T1T2-T2Z
10170     S1Z=S1
10180     IDENT=1HG
10190     CALL PRINTT (C,R)
10200     C

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10210 C BALANCED STRUCTURE "M":
10220 C GIVEN: T1,T2,S1,C
10230 C SOLVE FOR: S2,R
10240 C
10250 TTY=T1+T2
10260 IF (TTY .LT. 1.0) GO TO 1025
10270 C11=C1
10280 C1=FX*AA/AB+S1/(T2+ASHCR*T1)
10290 S2Z=T1T2*C1/AA-S1
10300 T1Z=T1
10310 T2Z=T2
10320 S1Z=S1
10330 IDENT=1PM
10340 RRR=R
10350 R=C1*PERIOD
10360 CALL PRINTF (C,R)
10370 C CALL CHECK
10380 C=C11
10390 R=RRR
10400 C
10410 C BALANCED STRUCTURE "I":
10420 C GIVEN: T1,T2,S1,R
10430 C SOLVE FOR: S2,C
10440 C
10450 IF (S1 .LT. .0) GO TO 1025
10460 ICOUNT=0
10470 GOAL=C1/S1
10480 DIF=GOAL*EPS
10490 J=-2
10500 Z=-.99999
10510 C2Z=A
10520 B=(1.-C2Z**SEA+SHORE)*(1.-C2Z)
10530 E=B/((T2+T1*C2Z**SHCRE)*(1.-C2Z**SEA))
10540 IF (E .GT. GOAL) GO TO 25
10550 XMIN=A
10560 XMAX=Z
10570 GO TO 26
10580 25 XMIN=Z
10590 XMAX=A
10600 26 CONTINUE
10610 C2Z=(XMAX+XMIN)/2.
10620 C2Z=ABS(C2Z)
10630 B=(1.-C2Z**SEA+SHORE)*(1.-C2Z)
10640 E=B/((T2+T1*C2Z**SHCRE)*(1.-C2Z**SEA))
10650 G1=ABS(COAL-B)
10660 IF (G1 .LE. DIF) GO TO 50
10670 IF (E .GT. GOAL) XMAX=C2Z
10680 IF (E .LT. GOAL) XMIN=C2Z
10690 ICOUNT=ICOUNT+1
10700 IF (ICOUNT .GE. 30) WRITE (20,1022)
10710 IF (ICOUNT .GE. 30) GO TO 50
10720 1022 FORMAT (/2X,"CONTINUATION EVALUATED MORE THAN 30 TIMES FOR "
10730 "THE FOLLOWING ROTATION PATTERN WITH NO CONVERGENCE"/)
10740 GO TO 26
10750 50 CONTINUE
10760 CCC=C
10770 C=1.-((1.-C2Z)*PERIOD)
10780 S2Z=(C1*T1)*(1.-C2Z**SHCRE)/(1.-C2Z)
10790 S2Z=S2Z+C2Z**SEA*S1*(1.-C2Z**SHORE)/(1.-C2Z**SEA)
10800 T1Z=T1
10810 T2Z=T2
10820 S1Z=S1
10830 IDENT=1HI
10840 C2Z=C2

```

```

10850      C2=C22
10860      CALL PRINTT (C,R)
10870      C      CALL CHECK
10880      C2=C22
10890      C=CCC
10900      GO TO 1030
10910      1025      WRITE (20,1066)
10920      1030      CONTINUE
10930      1066      FORMAT (/3X,'NO SOLUTIONS FOR VARIABLE CONTINUATION RATES '
10940      'DUE TO LACK OF NON-ZERO INPLTS')
10950      C
11040      C BALANCEC STRUCTURE "J":
11050      C GIVEN:      T1,T2,S1,S2
11060      C SOLVE FOR:  R,C
11070      C
11080      IF ((S1+S2) .LT. 1.0) GO TO 1125
11090      IF ((T1+T2) .LT. 1.0) GO TO 1125
11095      EPS=EPS
11097      EPS=EPS*.1
11098      GCAL=(T1/S2)*((S1+S2)/(T1+T2))
11100      DIF=GOAL-EPS
11110      AAA=-2
11115      Z=0.99999
11120      ICOUNT=0
11125      C22=AAA
11200      B=1/(1.-C22**SHORE)-(S1+C22**SEA)/(S2*(1-C22**SEA))
11210      IF (B .GT. GOAL) GO TO 1100
11220      XMIN=AAA
11230      XMAX=Z
11240      GO TO 1102
11250      1100      XMIN=Z
11260      XMAX=AAA
11270      1102      CONTINUE
11280      C22=(XMAX+XMIN)/2.
11290      B=1/(1.-C22**SHORE)-(S1+C22**SEA)/(S2*(1-C22**SEA))
11300      G1=ABS(GOAL-B)
11310      IF(G1.LE.CIF) GO TO 1105
11320      IF (B.GT. GCAL) XMAX=C22
11330      IF (B .LT. GOAL) XMIN=C22
11340      ICOUNT=ICOUNT+1
11350      IF (ICOUNT .LT. 30) GO TO 1102
11360      IF (PERCEN .NE. 0.0) GO TO 1110
11380      1105      CONTINUE
11390      CCC=C
11400      C=1.-((1.-C22)*PERIOD)
11410      R2=C1
11420      C1=(1.-C22)*(S1+S2)/(T1+T2)
11425      ICEAT=INJ
11430      T1Z=T1
11440      T2Z=T2
11450      S1Z=S1
11460      S2Z=S2
11470      C22=C2
11480      C2=C22
11490      RR=R
11500      R=C1*PERIOD
11502      IF (ICOUNT .LT. 30) GO TO 1108
11503      WRITE (20,1144) IDENT,SEA,SHORE,T2Z,T1Z,S1Z,S2Z,C,R
11504      GO TO 1109
11505      1108      CALL PRINTT (C,R)
11506      1109      CCONTINUE
11507      C      CALL CHECK
11530      C1=R2
11540      C=CCC

```

```

11550          C2=C22
11560          R=RR
11565      111C  CONTINUE
11675          EPS=DEPS
11680          GO TO 997
11690      1125  WRITE (20,1166)
11693      1144  FORMAT(1X,A1,F6.0,F7.0,14X,'NO FEASIBLE SOLUTION',14X,4F10.0,2X,
11695          *F11.4,F11.4)
11740      1166  FORMAT ('1',3X,'NO SOLUTIONS FOR THE VARIABLE CONTINUATION '
11741          **RATES DUE TO LACK OF NON-ZERO INPUTS*)
11743      997   CONTINUE
11750          SHORE=SHORE+1
11751          WRITE (20,191)
11752      191  FORMAT (20X,' ' //)
11753      998  CONTINUE
11754          SEA=SEA+1.
11755          SHCRE=SS+
11756      999  CONTINUE
11757          SEA=SSEA
11760          RETURN
11770          END
11780      C
11790      CC
11800      CCCCCC  END OF SUBROUTINE RCTATE  CCCCCCCC

```

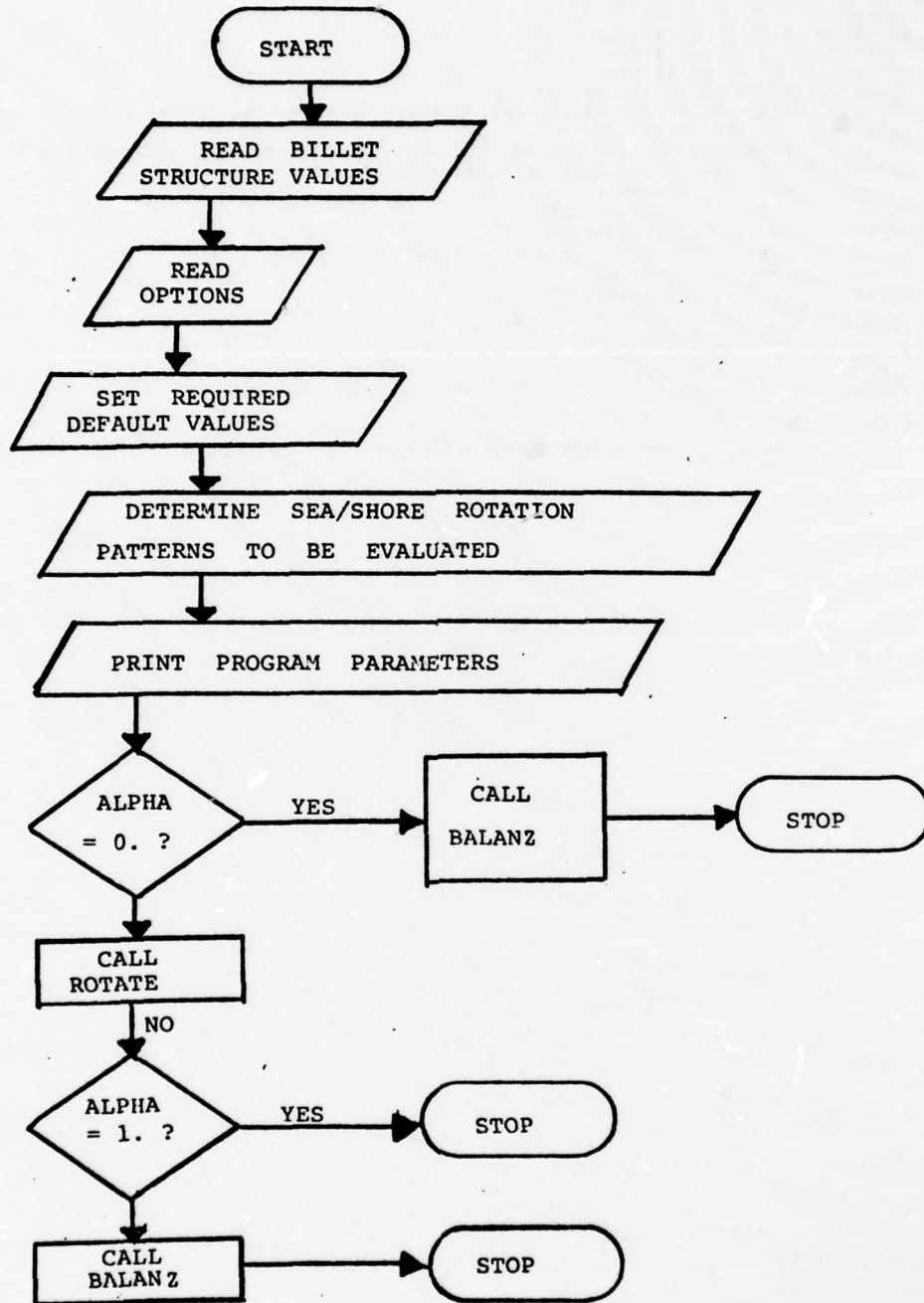


FIG. B-1: Flowchart of MOSES

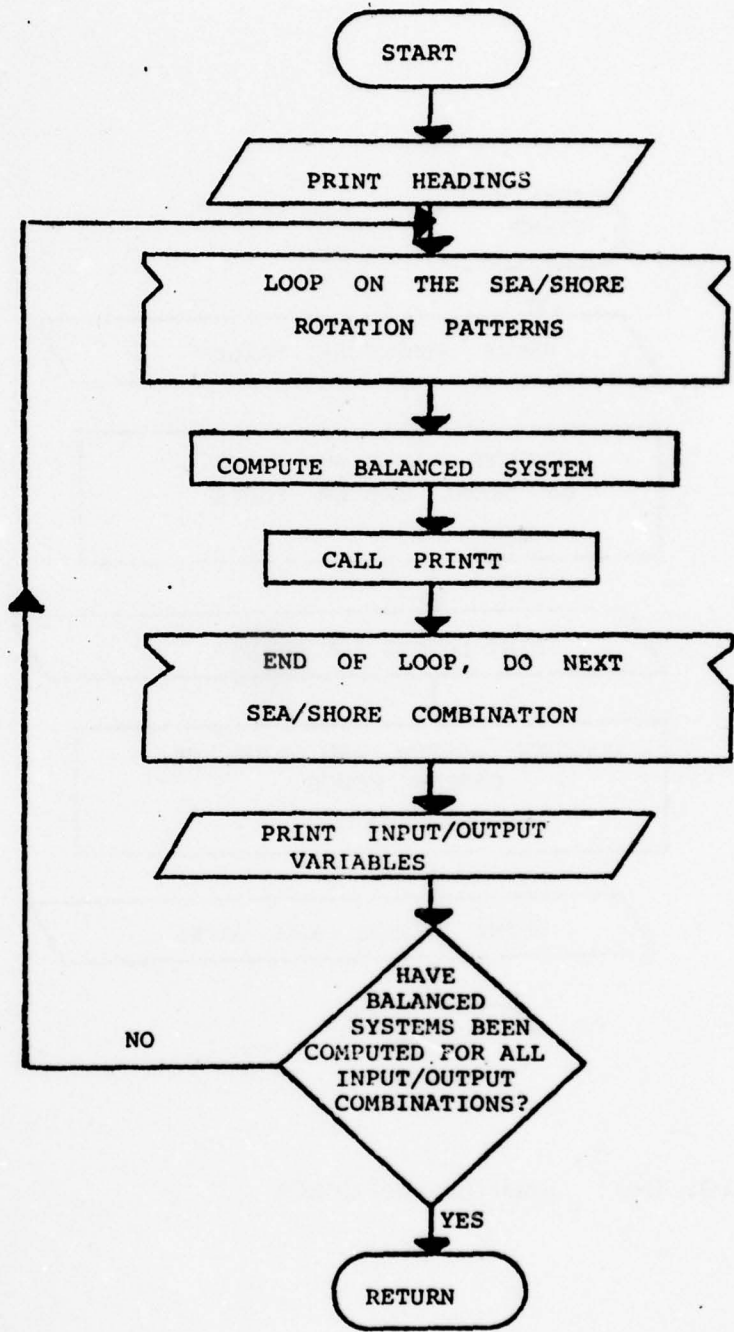


FIG. B-2: Subroutine BALANZ

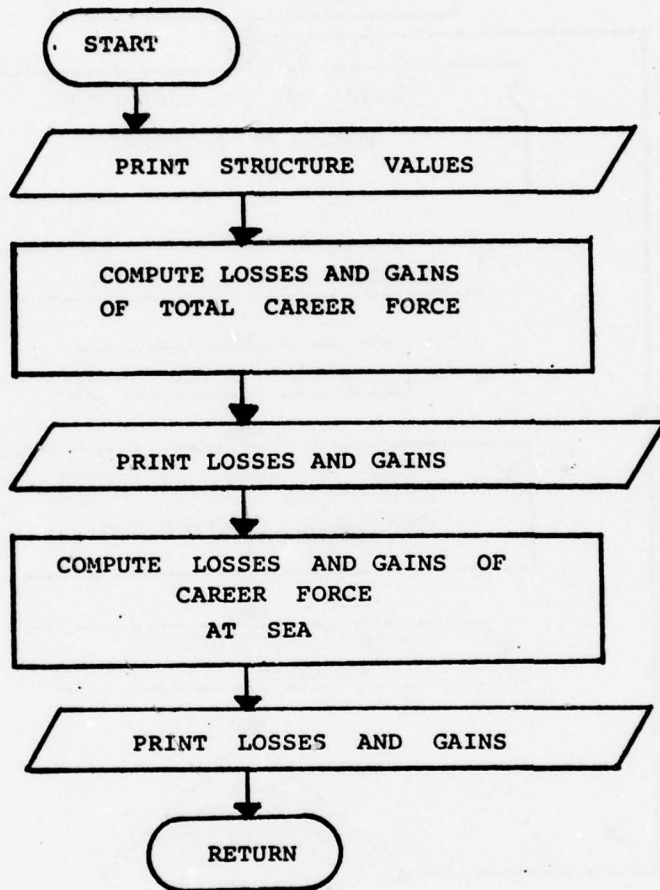


FIG. B-3: Subroutine CHECK

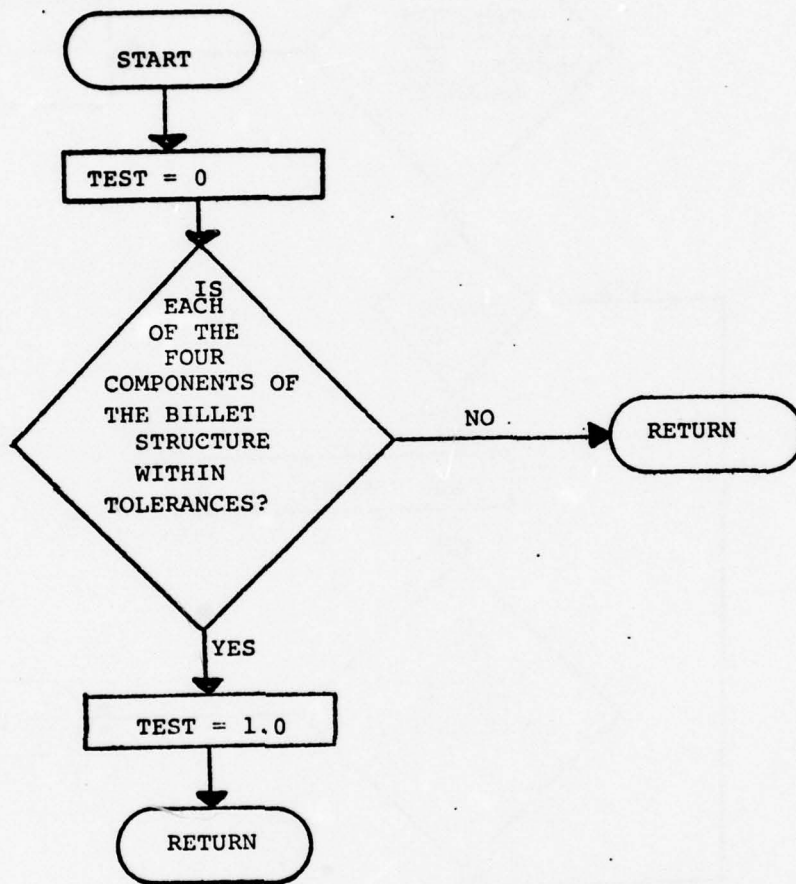


FIG. B-4: Subroutine FEASBL

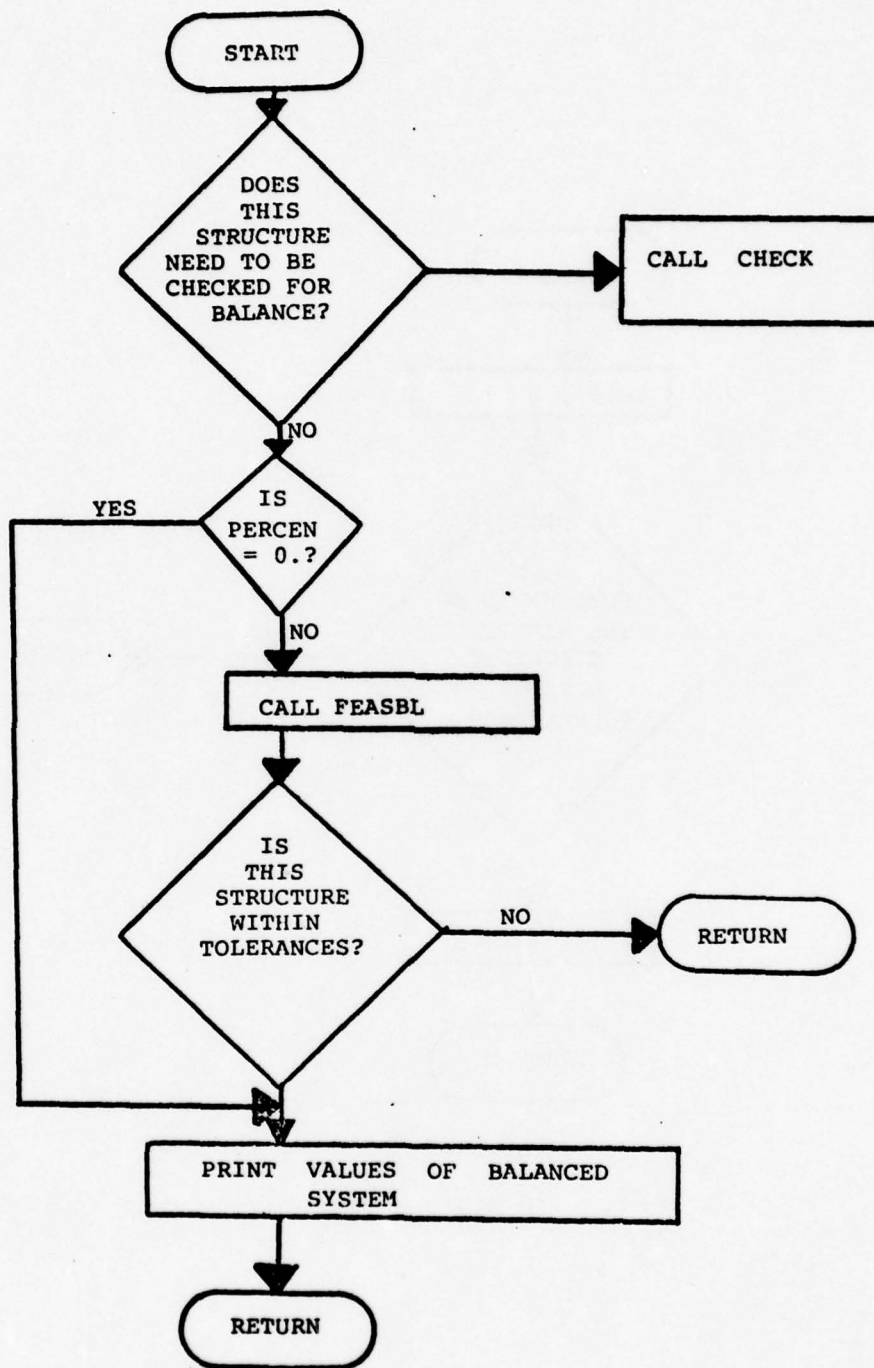


FIG. B-5: Subroutine PRINTT

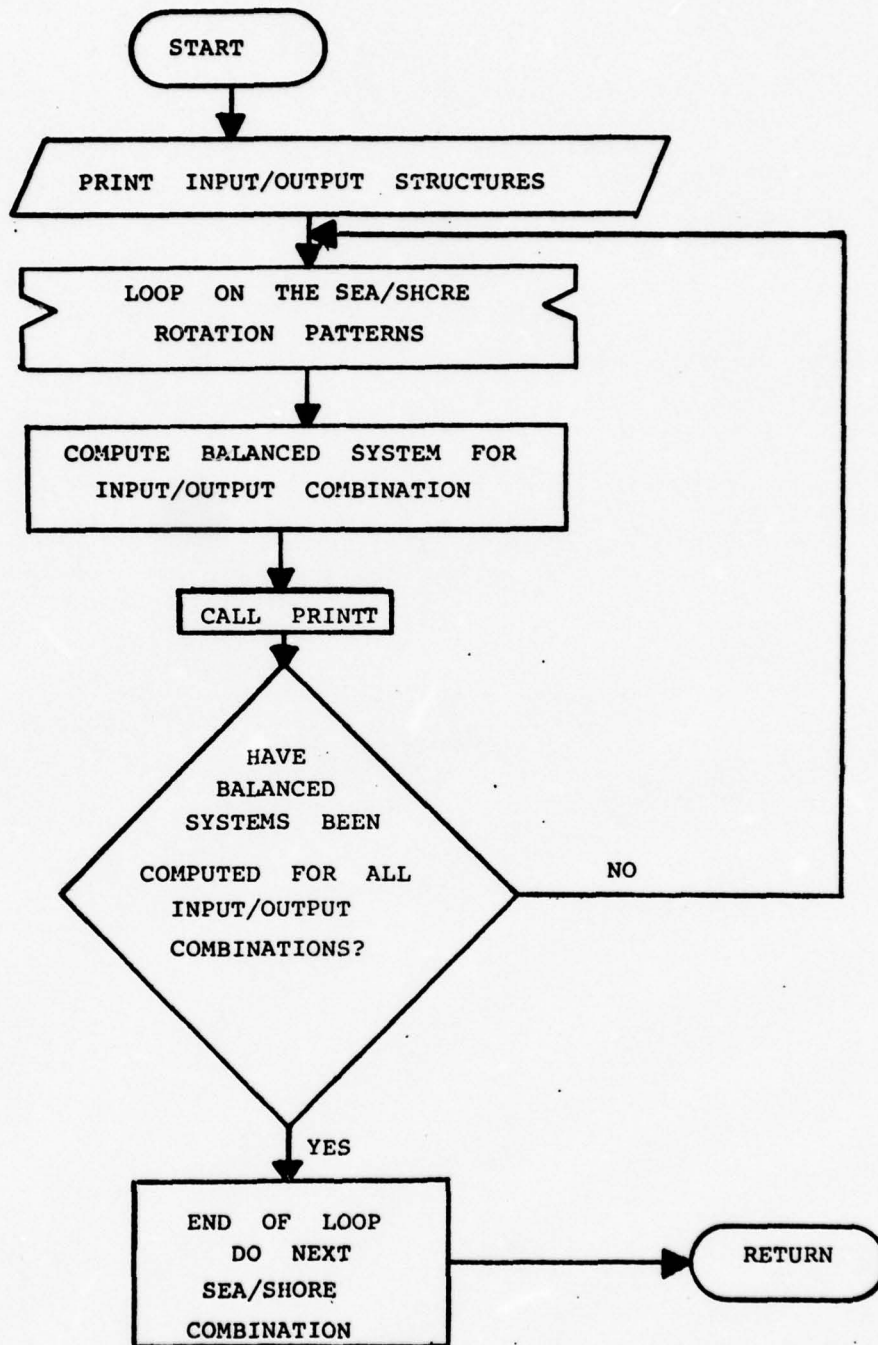


FIG. B-6: Subroutine ROTATE

APPENDIX C

SAMPLE OUTPUTS

The figures in this appendix are examples of the kinds of printed output that can be produced by MOSES.

Figures C-1, C-2 and C-3 present the balanced structures calculated by MOSES for three different input data sets.

The user has supplied values for only seven variables for the output in figure C-1. They were ALPHA, T1, T2, S1, S2, C and R. The other 19 initial parameters assumed their default values.

The user-specified values for for nine variables for Figure C-2: the seven for figure C-1, plus SEATIM and PERCEN. The other 17 parameters assumed their default values.

The user-specified values for 11 variables for figure C-3: the nine for figure C-2, plus T2MAX and S2MAX. The other 15 variables assumed default values.

```

PROGRAM P1R1P1R1E1R1E1S1E1C1
TIME= 146355.77 12= 35550.77 51= 74612.77 52= 51158.77 C= 6.8600077 P= 0.09315
TIME= 160345.77 123= 219447.77 1232= 25706.77 5152= 325770.77 A= 3.00077 B= 2.000
PERCC= 4.77 EPS= 6.0661677 SEATIME= 9.77 SHOTIME= 9.77 PERCCA= 0.00077 TIMID= 6.
TIME= 0.77 12MA= 0.77 12MAH= 0.77 51MA= 0.77 51MAH= 0.77 52MA= 0.77 52MAH= 0.
SEMAX= 0.77 ALPHA= 2.

```

SUMMARY OF INPUT AND OUTPUT VARIABLES FOR LINES A-J ARE:

- A GIVEN: FIRST-TERM SEA BILLET, CAREER SEA BILLET, CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLET AND CAREER SHORE BILLET
- B GIVEN: CAREER SEA BILLET, CAREER SHORE BILLET, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLET AND FIRST-TERM SEA BILLET
- C GIVEN: FIRST-TERM SHORE BILLET, FIRST-TERM SEA BILLET, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: CAREER SEA BILLET AND CAREER SHORE BILLET
- D GIVEN: FIRST-TERM SHORE BILLET, TOTAL SEA BILLET, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SEA BILLET, CAREER SEA BILLET AND CAREER SHORE BILLET
- E GIVEN: FIRST TERM SHORE BILLET EQUAL TO ZERO, TOTAL SEA BILLET, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SEA BILLET, CAREER SEA BILLET AND CAREER SHORE BILLET
- F GIVEN: TOTAL SEA BILLET, TOTAL SHORE BILLET, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLET, FIRST-TERM SEA BILLET, CAREER SHORE BILLET AND CAREER SEA BILLET
- G GIVEN: CAREER SEA BILLET, TOTAL FIRST-TERM BILLET, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLET, FIRST-TERM SEA BILLET AND CAREER SHORE BILLET
- H GIVEN: FIRST-TERM SHORE BILLET, FIRST-TERM SEA BILLET, CAREER SEA BILLET AND CAREER CONTINUATION RATE
 SOLVE FOR: CAREER SHORE BILLET AND FIRST-TERM RETENTION RATE
- I GIVEN: FIRST-TERM SHORE BILLET, FIRST-TERM SEA BILLET, CAREER SEA BILLET AND FIRST-TERM RETENTION RATE
 SOLVE FOR: CAREER SHORE BILLET AND CAREER CONTINUATION RATE
- J GIVEN: FIRST-TERM SHORE BILLET, FIRST-TERM SEA BILLET, CAREER SEA BILLET AND CAREER SHORE BILLET
 SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER CONTINUATION RATE

FIG. C-1: Sample Output - 7 User Specified Variables

SEA DUTY TOUR	SCORE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPECT	FIRST TERM SCORE	FIRST TERM SEA	CAREER SEA	CAREER SCORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
A 12	6	125770	180325	219447	66708	35550	144335	74612	51158	C-8600	0-0935
B 12	6	132274	199662	219447	17459	34877	144335	74612	51158	C-8600	0-0935
C 12	6	125770	180325	219447	16074	35550	144335	74612	51158	C-8600	0-0935
D 12	6	124774	166927	219447	90189	35550	144335	74612	51158	C-8600	0-0935
E 12	6	125770	166927	219447	82254	35550	144335	74612	51158	C-8600	0-0935
F 12	6	125770	166927	219447	70782	35550	144335	74612	51158	C-8600	0-0935
G 12	6	125770	166927	219447	66708	35550	144335	74612	51158	C-8600	0-0935
H 12	6	136477	180325	219447	15074	35550	144335	74612	51158	C-8600	0-0935
I 12	6	135064	180325	219447	9542	35550	144335	74612	51158	C-8600	0-0935
J 12	6	125770	180325	219447	66708	35550	144335	74612	51158	C-8600	0-0935
NC FEASIBLE SOLUTIONS											
A 12	9	125770	180325	219447	66708	35550	144335	74612	51158	C-8600	0-0935
B 12	9	139500	204988	219447	13042	35550	144335	74612	51158	C-8600	0-0935
C 12	9	125770	180325	219447	15725	35550	144335	74612	51158	C-8600	0-0935
D 12	9	126407	166927	219447	91954	35550	144335	74612	51158	C-8600	0-0935
E 12	9	115774	166927	219447	57254	35550	144335	74612	51158	C-8600	0-0935
F 12	9	125554	166927	219447	57738	35550	144335	74612	51158	C-8600	0-0935
G 12	9	125770	166927	219447	66708	35550	144335	74612	51158	C-8600	0-0935
H 12	9	125406	166927	219447	15816	35550	144335	74612	51158	C-8600	0-0935
I 12	9	148691	180325	219447	15816	35550	144335	74612	51158	C-8600	0-0935
J 12	9	142427	180325	219447	10385	35550	144335	74612	51158	C-8600	0-0935
NC FEASIBLE SOLUTIONS											
A 12	10	125770	180325	219447	66708	35550	144335	74612	51158	C-8600	0-0935
B 12	10	145508	217929	219447	14050	73354	144335	74612	70356	C-8600	0-0935
C 12	10	125770	166927	219447	15731	142243	144335	74612	51158	C-8600	0-0935
D 12	10	124407	166927	219447	97416	35550	144335	74612	61866	C-8600	0-0935
E 12	10	124864	166927	219447	10370	35550	144335	74612	66421	C-8600	0-0935
F 12	10	125770	166927	219447	62103	35550	144335	74612	62103	C-8600	0-0935
G 12	10	125554	166927	219447	66708	21910	163591	74612	47951	C-8600	0-0935
H 12	10	124407	166927	219447	20610	14115	144335	74612	47951	C-8600	0-0935
I 12	10	153461	180325	219447	11401	35550	144335	74612	75220	C-8600	0-0935
J 12	10	149832	180325	219447	11677	35550	144335	74612	51158	C-8600	0-0935
NC FEASIBLE SOLUTIONS											
A 12	11	125770	180325	219447	66708	35550	144335	74612	51158	C-8600	0-0935
B 12	11	151305	226675	219447	156133	61460	144335	74612	76693	C-8600	0-0935
C 12	11	125770	166927	219447	218731	161573	26846	74612	51158	C-8600	0-0935
D 12	11	130407	166927	219447	103563	35550	144335	74612	65013	C-8600	0-0935
E 12	11	125770	166927	219447	106370	35550	144335	74612	70820	C-8600	0-0935
F 12	11	114388	166927	219447	66708	6	171369	4678	66359	C-8600	0-0935
G 12	11	125554	166927	219447	66708	18172	163499	51946	68604	C-8600	0-0935
H 12	11	120407	166927	219447	224118	178319	2066	74612	87568	C-8600	0-0935
I 12	11	162180	180325	219447	11168	35550	144335	74612	82416	C-8600	0-0935
J 12	11	157230	180325	219447	11168	35550	144335	74612	51158	C-8600	0-0935

FIG. C-1 (Continued)

SEA CUTY TOUR	SPCRE CLTY TCUF	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPCRE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
A	13	125770	103165	219447	66708	35550	144835	74612	51158	0-8600	0-0935
B	11	147024	202400	219447	147037	74612	144835	74612	51158	0-8600	0-0935
C	11	125770	182419	212441	192448	14790	144835	74612	51158	0-8600	0-0935
D	11	125770	182419	202279	58513	35550	144835	57444	62583	0-8600	0-0935
E	11	125770	182419	219447	103520	0	144835	61313	67570	0-8600	0-0935
F	11	125770	182419	219447	64311	0	169390	49457	64011	0-8600	0-0935
G	11	125770	182419	219447	66708	20423	163179	56288	66283	0-8600	0-0935
H	11	125770	182419	219447	24331	159338	21049	74612	45795	0-8600	0-0935
I	11	125770	182419	219447	117330	35550	144835	74612	81790	0-8600	0-1214
J	11	125770	182419	219447	113408	35550	144835	74612	77458	0-8600	0-0935
NC FEASIBLE SOLUTION											
USER INPUTS											
A	13	125770	100315	219447	66708	35550	144835	74612	51158	0-8600	0-0935
B	12	125770	226174	219447	181033	43335	144835	74612	77694	0-8600	0-0935
C	12	125770	182419	219447	205222	137866	103550	74612	51158	0-8600	0-0935
D	12	125770	182419	199392	101830	35550	144835	54557	65850	0-8600	0-0935
E	12	125770	182419	219447	107622	0	169390	28666	72052	0-8600	0-0935
F	12	125770	182419	219447	67654	0	169390	27522	72052	0-8600	0-0935
G	12	125770	182419	219447	66708	188739	52706	69849	69849	0-8600	0-0935
H	12	125770	182419	219447	218718	172922	74612	74612	42795	0-8600	0-0935
I	12	125770	182419	219447	125608	35550	144835	74612	90036	0-8600	0-1214
J	12	125770	182419	219447	115818	35550	144835	74612	83380	0-8600	0-0935
ME FEASIBLE SOLUTION											
USER INPUTS											
A	14	125770	100315	219447	66708	35550	144835	74612	51158	0-8600	0-0935
B	14	125770	190502	219447	92315	43727	144835	74612	52580	0-8600	0-0935
C	14	125770	182419	210610	103180	52222	136190	74612	51158	0-8600	0-0935
D	14	125770	182419	219447	87353	35550	144835	69732	57003	0-8600	0-0935
E	14	125770	182419	219447	49060	0	161324	50423	49060	0-8600	0-0935
F	14	125770	182419	219447	86703	14952	168550	70797	49060	0-8600	0-0935
G	14	125770	182419	219447	122100	76585	103800	74612	42795	0-8600	0-0935
H	14	125770	182419	219447	58427	35550	144835	74612	54277	0-8600	0-1000
I	14	125770	182419	219447	60227	35550	144835	74612	51477	0-8600	0-0935
J	14	125770	182419	219447	66708	35550	144835	74612	51158	0-8600	0-0935
USER INPUTS											
A	14	125770	100315	219447	66708	35550	144835	74612	51158	0-8600	0-0935
B	14	125770	198928	219447	112257	54080	144835	74612	51158	0-8600	0-0935
C	14	125770	182419	210158	137031	18733	106566	74612	51158	0-8600	0-0935
D	14	125770	182419	210720	57136	35550	144835	58931	54428	0-8600	0-0935
E	14	125770	182419	219447	25659	0	133110	66139	58608	0-8600	0-0935
F	14	125770	182419	219447	25659	0	133110	55695	51603	0-8600	0-0935
G	14	125770	182419	219447	18326	10326	133076	66371	56182	0-8600	0-0935
H	14	125770	182419	219447	149522	10327	72758	74612	45795	0-8600	0-0935
I	14	125770	182419	219447	97214	35237	144835	74612	61684	0-8600	0-0935
J	14	125770	182419	219447	66708	35230	144835	74612	60018	0-8600	0-0935
NC FEASIBLE SOLUTION											
USER INPUTS											
A	14	125770	100315	219447	66708	35550	144835	74612	51158	0-8600	0-0935
B	14	125770	182419	219447	112257	54080	144835	74612	51158	0-8600	0-0935
C	14	125770	182419	210158	137031	18733	106566	74612	51158	0-8600	0-0935
D	14	125770	182419	210720	57136	35550	144835	58931	54428	0-8600	0-0935
E	14	125770	182419	219447	25659	0	133110	66139	58608	0-8600	0-0935
F	14	125770	182419	219447	25659	0	133110	55695	51603	0-8600	0-0935
G	14	125770	182419	219447	18326	10326	133076	66371	56182	0-8600	0-0935
H	14	125770	182419	219447	149522	10327	72758	74612	45795	0-8600	0-0935
I	14	125770	182419	219447	97214	35237	144835	74612	61684	0-8600	0-0935
J	14	125770	182419	219447	66708	35230	144835	74612	60018	0-8600	0-0935

FIG. C-1 (Continued)

SEA DUTY TOUR	SHEER	TOTAL CAREER	TOTAL FIRST YEAR	TOTAL AT SEA	TOTAL ASHORE	FIRST YEAR SHORE	FIRST YEAR SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST YEAR RETENTION
USER INPUTS											
A 1A	10	123770	100325	219447	6700	35550	144835	74612	51158	0.8600	0.0935
B 1A	10	123770	206551	219447	12711	62358	144835	74612	51158	0.8600	0.0935
C 1A	10	123770	186419	219447	13707	105549	82870	74612	51158	0.8600	0.0935
D 1A	10	120407	180325	207311	9451	35550	144835	62476	57931	0.8600	0.0935
E 1A	10	120407	18553	219447	9662	35550	144835	65414	57931	0.8600	0.0935
F 1A	10	111026	16322	219447	7895	0	166222	33235	37895	0.8600	0.0935
G 1A	10	120407	180325	219447	6700	26406	157193	62254	60300	0.8600	0.0935
H 1A	10	143795	180325	219447	10713	124321	56364	74612	47795	0.8600	0.1116
I 1A	10	141155	180325	219447	10293	35550	144835	74612	65414	0.8600	0.0935
J 1A	10		MC FEASIBLE	SOLUTION		35550	144835	74612	51158	1.0000	0.0000
USER INPUTS											
A 1A	11	123770	180325	219447	6700	35550	144835	74612	51158	0.8600	0.0935
B 1A	11	143364	214778	219447	12695	69943	144835	74612	51158	0.8600	0.0935
C 1A	11	123770	180325	219447	17038	124880	63540	74612	51158	0.8600	0.0935
D 1A	11	120407	180325	219447	5636	35550	144835	59321	61068	0.8600	0.0935
E 1A	11	112639	168747	219447	10052	35550	144835	62854	65402	0.8600	0.0935
F 1A	11	122553	163602	219447	6700	22571	161011	50700	61938	0.8600	0.0935
G 1A	11	120407	180325	219447	107420	141625	38760	74612	45795	0.8600	0.0935
H 1A	11	151644	180325	219447	11212	35550	144835	74612	74612	0.8600	0.1116
I 1A	11	147667	180325	219447	10695	35550	144835	74612	70258	0.8600	0.0935
J 1A	11		MC FEASIBLE	SOLUTION		35550	144835	74612	51158	1.0000	0.0000
USER INPUTS											
A 1A	12	123770	180325	219447	6700	35550	144835	74612	51158	0.8600	0.0935
B 1A	12	142379	222291	219447	13223	77458	144835	74612	72767	0.8600	0.0935
C 1A	12	123770	180325	219447	19209	149551	47469	74612	51158	0.8600	0.0935
D 1A	12	120407	180325	219447	9933	35550	144835	56434	69834	0.8600	0.0935
E 1A	12	118167	171037	219447	10464	0	171337	60436	69434	0.8600	0.0935
F 1A	12	122553	183601	219447	6700	18987	164814	48410	67577	0.8600	0.0935
G 1A	12	120407	180325	219447	20408	156012	24373	74612	47795	0.8600	0.0935
H 1A	12	159221	180325	219447	12059	35550	144835	74612	86689	0.8600	0.1216
I 1A	12	154168	180325	219447	11404	35550	144835	74612	79554	0.8600	0.0935
J 1A	12		MC FEASIBLE	SOLUTION		35550	144835	74612	51158	1.0000	0.0000
USER INPUTS											
A 1A	6	123770	180325	219447	6700	35550	144835	74612	51158	0.8600	0.0935
B 1A	6	124721	186938	219447	9272	42103	144835	74612	50189	0.8600	0.0935
C 1A	6	123770	180325	219447	8767	37600	150810	74612	51158	0.8600	0.0935
D 1A	6	120407	180325	219447	84582	35550	144835	71375	49032	0.8600	0.0935
E 1A	6	121921	182745	219447	8201	35550	147195	72252	47711	0.8600	0.0935
F 1A	6	120407	180325	219447	47355	0	160701	59446	47355	0.8600	0.0935
G 1A	6	122553	183601	219447	6700	16886	146713	48410	48020	0.8600	0.0935
H 1A	6	120407	180325	219447	10767	16972	118413	74612	47795	0.8600	0.0935
I 1A	6	125868	180325	219447	8806	35550	144835	74612	51256	0.8600	0.0935
J 1A	6	123146	180325	219447	6284	35550	144835	74612	50714	0.8600	0.0935
K 1A	6	123770	180325	219447	6700	35550	144835	74612	51158	0.8600	0.0935

FIG. C-1 (Continued)

SEA DUTY TOUR	SMCR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
A	15	125770	180385	219447	6708	35550	144835	74612	51158	9-8600	0-0935
B	15	130109	194914	219447	18572	50079	144835	74612	55993	0-8600	0-0935
C	15	125770	180385	219447	18572	67280	144835	74612	51158	0-8600	0-0935
D	15	120407	180385	219447	62311	35550	144835	67626	52781	0-8600	0-0935
E	15	125770	180385	219447	62311	35550	144835	67626	52781	0-8600	0-0935
F	15	125770	180385	219447	62311	35550	144835	67626	52781	0-8600	0-0935
G	15	125770	180385	219447	62311	35550	144835	67626	52781	0-8600	0-0935
H	15	125770	180385	219447	62311	35550	144835	67626	52781	0-8600	0-0935
I	15	125770	180385	219447	62311	35550	144835	67626	52781	0-8600	0-0935
J	15	125770	180385	219447	62311	35550	144835	67626	52781	0-8600	0-0935
USER INPUTS											
A	15	125770	180385	219447	6708	35550	144835	74612	51158	0-8600	0-0935
B	15	132463	202612	219447	11698	57777	144835	74612	60831	0-8600	0-0935
C	15	125770	180385	219447	12095	90936	97493	74612	51158	0-8600	0-0935
D	15	120407	180385	219447	91762	35550	144835	64155	56212	0-8600	0-0935
E	15	125770	180385	219447	94423	35550	144835	66769	56873	0-8600	0-0935
F	15	110285	165222	219447	56050	0	182222	54223	56266	0-8600	0-0935
G	15	125770	180385	219447	62708	28401	152201	64246	52307	0-8600	0-0935
H	15	120407	180385	219447	15504	109709	70676	74612	45795	0-8600	0-0935
I	15	139445	196385	219447	10283	35550	144835	74612	65333	0-8600	0-0935
J	15	125770	180385	219447	8708	35550	144835	74612	51158	0-8600	0-0935
USER INPUTS											
A	15	125770	180385	219447	6708	35550	144835	74612	51158	0-8600	0-0935
B	15	146062	220740	219447	130795	65205	144835	74612	65590	0-8600	0-0935
C	15	125770	180385	219447	161425	18297	78137	74612	51158	0-8600	0-0935
D	15	127323	190748	219447	36826	35550	158158	60464	59163	0-8600	0-0935
E	15	119288	187622	219447	80058	0	126622	58129	60563	0-8600	0-0935
F	15	122554	185611	219447	67008	14583	150398	59439	62145	0-8600	0-0935
G	15	120407	180385	219447	172008	12013	33372	74612	45830	0-8600	0-0935
H	15	147166	180385	219447	101808	35550	144835	74612	72536	0-8600	0-0935
I	15	143666	180385	219447	104804	35550	144835	74612	67234	0-8600	0-0935
J	15	125770	180385	219447	8708	35550	144835	74612	51158	1-0000	0-0000
MC FEASIBLE SOLUTION											
USER INPUTS											
A	15	125770	180385	219447	6708	35550	144835	74612	51158	0-8600	0-0935
B	15	144966	217208	219447	142747	22373	144835	74612	79374	0-8600	0-0935
C	15	125770	180385	219447	177496	16318	62981	74612	51158	0-8600	0-0935
D	15	120407	180385	219447	161806	35550	144835	58144	62264	0-8600	0-0935
E	15	113405	165895	219447	62853	0	157585	48662	63856	0-8600	0-0935
F	15	122554	181601	219447	62708	20966	162635	49552	63856	0-8600	0-0935
G	15	120407	180385	219447	187198	11199	38986	74612	65742	0-8600	0-0935
H	15	154313	180385	219447	11451	35550	144835	74612	79901	0-8600	0-0935
I	15	150013	180385	219447	110951	35550	144835	74612	75401	0-8600	0-0935
J	15	125770	180385	219447	8708	35550	144835	74612	51158	1-0000	0-0000
NO FEASIBLE SOLUTION											

FIG. C-1 (Continued)

SEA DUTY TOUR	SEA SMOKE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
SEA INPUTS											
A 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
B 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
C 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
D 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
E 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
F 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
G 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
H 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
I 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
J 16	8	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
USER INPUTS											
A 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
B 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
C 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
D 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
E 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
F 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
G 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
H 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
I 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
J 16	9	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
USER INPUTS											
A 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
B 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
C 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
D 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
E 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
F 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
G 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
H 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
I 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935
J 16	10	125770	100365	219447	87708	35550	144835	74612	51158	0.8600	0.0935

FIG. C-1 (Continued)

SEA DUTY TOUR	SEA SHCRE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASBURE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
A	16	125770	100325	219447	62708	35550	144835	74612	51158	0.8600	0.6935
B	16	120286	121774	219447	32393	67933	144835	74612	87434	0.8600	0.6535
C	16	125770	184419	149439	164750	133982	74827	74612	51158	0.8600	0.6935
D	16	120407	100325	204563	98217	35550	144835	59730	66877	0.8600	0.6935
E	16	120407	191836	219447	100325	0	168054	50593	62117	0.8600	0.6535
F	16	122534	167601	219447	62708	28016	160789	58858	62156	0.8600	0.6535
G	16	120407	120325	226344	174408	128653	51732	74612	47795	0.8600	0.6935
H	16	120407	100325	219447	11364	35550	144835	74612	75794	0.8600	0.1167
I	16	120407	100325	219447	107333	35550	144835	74612	71783	0.8600	0.6935
J	16	125770	100325	219447	107333	35550	144835	74612	51158	1.0000	0.0000
NO FEASIBLE SOLUTION											
USER INPUTS											
A	17	125770	100325	219447	62708	35550	144835	74612	51158	0.8600	0.6935
B	17	120815	100952	219447	82365	36162	144835	74612	46203	0.8600	0.6535
C	17	125770	184419	249377	64113	13653	174765	74612	51158	0.8600	0.6935
D	17	120407	100325	219447	61660	35550	144835	74297	66110	0.8600	0.6935
E	17	120558	106612	219447	81223	35550	144835	74395	46173	0.8600	0.6935
F	17	125770	152446	219447	44428	0	152446	61231	44428	0.8600	0.6535
G	17	122534	101601	219447	62708	40301	143100	76137	46407	0.8600	0.6935
H	17	120407	100325	219447	87113	14118	142167	74612	45795	0.8600	0.6935
I	17	120407	100325	219447	61655	35550	144835	74612	46355	0.8600	0.6935
J	17	125770	100325	219447	62708	35550	144835	74612	46255	0.8600	0.6935
USER INPUTS											
A	17	125770	100325	219447	62708	35550	144835	74612	51158	0.8600	0.6935
B	17	125770	100325	219447	62708	35550	144835	74612	51158	0.8600	0.6935
C	17	120407	100325	215452	63400	43306	145113	74612	51107	0.8600	0.6535
D	17	122362	103313	219447	82228	35550	144835	70617	47790	0.8600	0.6935
E	17	107365	160443	219447	46763	0	160443	52672	50678	0.8600	0.6935
F	17	122534	103601	219447	62708	36005	147596	71851	50703	0.8600	0.6935
G	17	120407	100325	190437	110355	64560	115825	74612	47795	0.8600	0.6535
H	17	122220	100325	219447	62150	35550	144835	74612	52608	0.8600	0.6935
I	17	126486	100325	219447	87422	35550	144835	74612	51872	0.8667	0.6935
J	17	125770	100325	219447	62708	35550	144835	74612	51158	0.8733	0.0883
USER INPUTS											
A	17	125770	100325	219447	62708	35550	144835	74612	51158	0.8600	0.6935
B	17	130451	195432	219447	104436	55550	144835	74612	51158	0.8600	0.6935
C	17	125770	100325	196049	112140	66882	121417	74612	51158	0.8600	0.6935
D	17	120407	100325	212662	82310	35550	144835	67237	51180	0.8600	0.6935
E	17	120407	105881	219447	90310	35550	150311	69116	54960	0.8600	0.6935
F	17	125770	163316	219447	52822	0	163316	56131	52822	0.8600	0.6535
G	17	122534	123601	219447	62708	31956	131643	67800	52822	0.8600	0.6935
H	17	120407	100325	169243	117508	65754	131643	74612	47795	0.8600	0.6935
I	17	131637	100325	219447	84572	35550	144835	74612	55221	0.8600	0.1017
J	17	125770	100325	219447	62708	35550	144835	74612	51158	0.8724	0.0935
NO FEASIBLE SOLUTION											

FIG. C-1 (Continued)

SEA	SHORE	TOTAL	TOTAL	TOTAL	TOTAL	FIRST	CAREER	FIRST	CAREER	CAREER	CAREER	FIRST	CAREER	FIRST	CAREER	CAREER	FIRST	CAREER	FIRST	CAREER	
CUITY	OCY	CAREER	AT	ASHORE	SHORE	TERM	SEA	TERM	SEA	SHORE	SEA	TERM	SEA	SHORE	SEA	SHORE	TERM	SEA	SHORE	RETENTION	
TOUF	TOUF																				
NO FEASIBLE SOLUTION																					
USER	INPUTS	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
A	17	135017	202773	219447	137843	37438	144835	144835	144835	64012	74612	144835	144835	144835	74612	60405	0-8600	0-8600	0-8600	0-8600	0-8600
B	17	125770	182419	219447	137470	66312	102107	102107	102107	51158	74612	102107	102107	102107	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
C	17	120407	180385	219447	14883	35550	144835	144835	144835	56310	64097	144835	144835	144835	64097	56310	0-8600	0-8600	0-8600	0-8600	0-8600
D	17	125770	182323	219447	94828	35550	144835	144835	144835	5932	66674	144835	144835	144835	66674	5932	0-8600	0-8600	0-8600	0-8600	0-8600
E	17	110381	165666	219447	56708	0	152666	152666	152666	56800	5791	152666	152666	152666	5791	56800	0-8600	0-8600	0-8600	0-8600	0-8600
F	17	122554	181401	219447	14883	28143	152460	152460	152460	63987	63987	152460	152460	152460	63987	63987	0-8600	0-8600	0-8600	0-8600	0-8600
G	17	120407	182323	219447	14883	103056	148835	148835	148835	65347	74612	148835	148835	148835	74612	65347	0-8600	0-8600	0-8600	0-8600	0-8600
H	17	120407	182323	219447	101097	35550	144835	144835	144835	63446	74612	144835	144835	144835	74612	63446	0-8600	0-8600	0-8600	0-8600	0-8600
I	17	117658	180385	219447	98596	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
J	17	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
NO FEASIBLE SOLUTION																					
USER	INPUTS	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
A	17	119474	182419	219447	124252	64012	144835	144835	144835	64012	74612	144835	144835	144835	74612	64012	0-8600	0-8600	0-8600	0-8600	0-8600
B	17	125770	182419	219447	153542	102384	144835	144835	144835	74612	74612	144835	144835	144835	74612	74612	0-8600	0-8600	0-8600	0-8600	0-8600
C	17	125770	180385	219447	94757	35550	144835	144835	144835	59207	61200	144835	144835	144835	61200	59207	0-8600	0-8600	0-8600	0-8600	0-8600
D	17	125770	182419	219447	14658	35550	144835	144835	144835	63266	64354	144835	144835	144835	64354	63266	0-8600	0-8600	0-8600	0-8600	0-8600
E	17	125770	182419	219447	66528	0	157477	157477	157477	60529	51544	157477	157477	157477	51544	60529	0-8600	0-8600	0-8600	0-8600	0-8600
F	17	122554	183601	219447	67708	35538	152063	152063	152063	62170	63108	152063	152063	152063	63108	62170	0-8600	0-8600	0-8600	0-8600	0-8600
G	17	120407	182323	219447	16240	17483	152063	152063	152063	6585	74612	152063	152063	152063	74612	6585	0-8600	0-8600	0-8600	0-8600	0-8600
H	17	120407	180385	219447	107332	35550	144835	144835	144835	72182	74612	144835	144835	144835	74612	72182	0-8600	0-8600	0-8600	0-8600	0-8600
I	17	125770	180385	219447	104361	35550	144835	144835	144835	68811	74612	144835	144835	144835	74612	68811	0-8600	0-8600	0-8600	0-8600	0-8600
J	17	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
NO FEASIBLE SOLUTION																					
USER	INPUTS	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
A	18	119172	172515	219447	72260	33700	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
B	18	125770	182419	219447	54285	3727	184692	184692	184692	44360	74612	184692	184692	184692	74612	44360	0-8600	0-8600	0-8600	0-8600	0-8600
C	18	120407	180385	219447	60377	35550	144835	144835	144835	44827	75882	144835	144835	144835	75882	44827	0-8600	0-8600	0-8600	0-8600	0-8600
D	18	119474	179690	219447	60187	35550	144835	144835	144835	44837	75307	144835	144835	144835	75307	44837	0-8600	0-8600	0-8600	0-8600	0-8600
E	18	125770	182419	219447	43164	0	157400	157400	157400	42164	61959	157400	157400	157400	61959	42164	0-8600	0-8600	0-8600	0-8600	0-8600
F	18	122554	183601	219447	67708	41812	147788	147788	147788	44896	77658	147788	147788	147788	77658	44896	0-8600	0-8600	0-8600	0-8600	0-8600
G	18	120407	180385	219447	72825	28092	152292	152292	152292	45795	74612	152292	152292	152292	74612	45795	0-8600	0-8600	0-8600	0-8600	0-8600
H	18	119474	180385	219447	76073	35550	144835	144835	144835	44253	74612	144835	144835	144835	74612	44253	0-8600	0-8600	0-8600	0-8600	0-8600
I	18	119318	180385	219447	79556	35550	144835	144835	144835	44406	74612	144835	144835	144835	74612	44406	0-8600	0-8600	0-8600	0-8600	0-8600
J	18	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
NO FEASIBLE SOLUTION																					
USER	INPUTS	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
A	18	119474	184620	219447	90274	40785	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
B	18	125770	184620	219447	64222	33379	152041	152041	152041	42722	72015	152041	152041	152041	72015	42722	0-8600	0-8600	0-8600	0-8600	0-8600
C	18	120407	180385	219447	64601	35550	144835	144835	144835	49051	72652	144835	144835	144835	72652	49051	0-8600	0-8600	0-8600	0-8600	0-8600
D	18	125770	18318	219447	6732	0	16004	16004	16004	47432	59189	16004	16004	16004	59189	47432	0-8600	0-8600	0-8600	0-8600	0-8600
E	18	122554	183601	219447	67708	37565	145335	145335	145335	49143	73111	145335	145335	145335	73111	49143	0-8600	0-8600	0-8600	0-8600	0-8600
F	18	120407	180385	219447	100828	34833	123752	123752	123752	48753	74612	123752	123752	123752	74612	48753	0-8600	0-8600	0-8600	0-8600	0-8600
G	18	120407	180385	219447	65226	35550	144835	144835	144835	50276	74612	144835	144835	144835	74612	50276	0-8600	0-8600	0-8600	0-8600	0-8600
H	18	120407	180385	219447	6334	35550	144835	144835	144835	47784	74612	144835	144835	144835	74612	47784	0-8600	0-8600	0-8600	0-8600	0-8600
I	18	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600
J	18	125770	180385	219447	67708	35550	144835	144835	144835	51158	74612	144835	144835	144835	74612	51158	0-8600	0-8600	0-8600	0-8600	0-8600

FIG. C-1 (Continued)

SEA ENTY TOUR	SICRE CLTY TCUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASWORE	FIRST TERM SCORE	FIRST SEA	CAREER SEA	CAREER SCORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
A	10	125770	180365	219447	62708	35550	144835	74612	51158	0-8600	0-0935
B	10	126468	192457	219447	103475	37622	144835	74612	53031	0-8600	0-0935
C	10	125770	186419	205972	142132	37622	144835	74612	51158	0-8600	0-0935
D	10	126407	180365	213404	42308	35550	144835	60569	51838	0-8600	0-0935
E	10	123199	184459	219447	84006	35550	144835	70138	53256	0-8600	0-0935
F	10	126468	162386	219447	51498	35550	144835	51498	51498	0-8600	0-0935
G	10	125555	185402	219447	62708	33551	150331	69198	53157	0-8600	0-0935
H	10	126407	180365	219447	124622	35550	144835	74612	45795	0-8600	0-0935
I	10	125770	180365	219447	90631	35550	144835	74612	55141	0-8600	0-0935
J	10	125770	180365	219447	62708	35550	144835	74612	51158	0-8600	0-0935
USER INPUTS											
A	10	125770	180365	219447	62708	35550	144835	74612	51158	0-8600	0-0935
B	10	125770	195054	219447	112476	34219	144835	74612	52257	0-8600	0-0935
C	10	125770	186420	206647	127531	37622	144835	74612	51158	0-8600	0-0935
D	10	124047	180365	210289	90583	35550	144835	63454	54933	0-8600	0-0935
E	10	124998	187283	219447	92144	35550	151713	67734	57264	0-8600	0-0935
F	10	130011	164811	219447	53375	0	164811	54636	55375	0-8600	0-0935
G	10	122554	184611	219447	62708	29752	153849	65598	56956	0-8600	0-0935
H	10	120467	180365	219447	136926	31131	161666	74612	45795	0-8600	0-0935
I	10	137253	180365	219447	94193	35550	144835	74612	62443	0-8600	0-0935
J	10	135093	180365	219447	96033	35550	144835	74612	60483	0-8600	0-0935
		125770	180365	219447	62708	35550	144835	74612	51158	0-8600	0-0935
USER INPUTS											
A	10	125770	180365	219447	62708	35550	144835	74612	51158	0-8600	0-0935
B	10	137116	204721	219447	125492	60586	144835	74612	62556	0-8600	0-0935
C	10	125770	180365	205972	143114	35550	144835	74612	51158	0-8600	0-0935
D	10	126328	189358	207378	94318	35550	144835	65441	57844	0-8600	0-0935
E	10	115490	187028	219447	50714	0	157228	52119	59371	0-8600	0-0935
F	10	122554	184611	219447	62708	26174	157447	72008	60754	0-8600	0-0935
G	10	120467	180365	219447	152114	107517	172866	74612	45795	0-8600	0-0935
H	10	143596	180365	219447	103514	35550	144835	74612	68784	0-8600	0-0935
I	10	146415	180365	219447	101354	35550	144835	74612	65693	0-8600	0-0935
J	10	125770	180365	219447	62708	35550	144835	74612	51158	0-8600	0-0935
USER INPUTS											
A	10	125770	180365	219447	62708	35550	144835	74612	51158	0-8600	0-0935
B	10	117707	176340	219447	74600	31509	144835	74612	43095	0-8600	0-0935
C	10	125770	180365	206153	46037	-51424	193541	74612	51158	0-8600	0-0935
D	10	120407	180365	221596	78196	35550	144835	76751	43446	0-8600	0-0935
E	10	104661	156756	219447	42014	0	156796	62651	42014	0-8600	0-0935
F	10	122554	183601	219447	62708	43210	140391	79056	43988	0-8600	0-0935
G	10	120467	180365	219447	62708	19241	161144	74612	45795	0-8600	0-0935
H	10	117036	180365	219447	77974	35550	144835	74612	42424	0-8600	0-0935
I	10	117377	180365	219447	74315	35550	144835	74612	42765	0-8600	0-0935
J	10	125770	180365	219447	62708	35550	144835	74612	51158	0-8600	0-0935

FIG. C-1 (Continued)

SEA DUTY FOLD TCLR	SEA SNGRE DUTY TCLR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPCRE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
A	9.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	51158.	0.8600	0.0935
B	10.	122261.	102152.	219447.	6726.	30357.	144835.	74612.	47659.	0.8600	0.0935
C	9.	125770.	102152.	219447.	7567.	35550.	144835.	74612.	51158.	0.8600	0.0935
D	9.	120407.	100385.	219447.	8285.	35550.	144835.	71152.	47255.	0.8600	0.0935
E	9.	121115.	101445.	219447.	8113.	35550.	144835.	73552.	47563.	0.8600	0.0935
F	9.	106343.	159118.	219447.	4216.	0.	159118.	60129.	46216.	0.8600	0.0935
G	10.	122554.	103601.	219447.	6700.	39014.	145377.	74866.	47894.	0.8600	0.0935
H	9.	120407.	100385.	209213.	91579.	45784.	146691.	74612.	45795.	0.8600	0.0935
I	9.	122610.	100385.	219447.	81748.	35550.	144835.	74612.	48198.	0.8600	0.0935
J	9.	122543.	100385.	219447.	81481.	35550.	144835.	74612.	47531.	0.8624	0.0935
J	9.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	51158.	0.8339	0.1150
USER INPUTS											
A	10.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	51158.	0.8600	0.0935
B	10.	126594.	105404.	219447.	97051.	44959.	144835.	74612.	52822.	0.8600	0.0935
C	10.	125770.	102152.	219447.	9136.	48205.	140214.	74612.	51156.	0.8600	0.0935
D	10.	120407.	100385.	219447.	8116.	35550.	144835.	69811.	50296.	0.8600	0.0935
E	10.	122765.	101253.	219447.	8124.	35550.	144835.	71071.	50231.	0.8600	0.0935
F	10.	127952.	101726.	219447.	5231.	0.	161726.	57721.	50231.	0.8600	0.0935
G	10.	122553.	102502.	219447.	6700.	35035.	145387.	70880.	51873.	0.8600	0.0935
H	10.	125677.	100385.	180619.	117773.	68978.	115407.	74612.	45795.	0.8600	0.0935
I	10.	127667.	100385.	219447.	8525.	35550.	144835.	74612.	54075.	0.8600	0.0935
J	10.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	5375.	0.8600	0.0935
J	10.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	51158.	0.8838	0.0611
USER INPUTS											
A	11.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	51158.	0.8600	0.0935
B	11.	130954.	104185.	219447.	107692.	51350.	144835.	74612.	56342.	0.8600	0.0935
C	11.	125770.	102420.	219447.	116696.	67536.	126884.	74612.	51158.	0.8600	0.0935
D	11.	125770.	100385.	215477.	8245.	35550.	144835.	68712.	53895.	0.8600	0.0935
E	11.	124308.	102290.	219447.	9119.	35550.	150740.	68712.	55441.	0.8600	0.0935
F	11.	109487.	140026.	219447.	5466.	0.	16326.	5466.	5466.	0.8600	0.0935
G	11.	122554.	101651.	219447.	6700.	31257.	152344.	67102.	55351.	0.8600	0.0935
H	11.	120407.	100385.	170715.	136077.	44282.	96103.	74612.	45795.	0.8600	0.0935
I	11.	114666.	100385.	219447.	55604.	35550.	144835.	74612.	6054.	0.8600	0.1045
J	11.	112813.	100385.	219447.	91251.	35550.	144835.	74612.	58201.	0.8731	0.0935
J	11.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	51158.	0.9272	0.0508
USER INPUTS											
A	12.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	51158.	0.8600	0.0935
B	12.	115064.	102152.	219447.	11760.	37308.	144835.	74612.	60352.	0.8600	0.0935
C	12.	125770.	102419.	219447.	13785.	43607.	104835.	74612.	51158.	0.8600	0.0935
D	12.	120407.	100385.	219447.	9463.	35550.	153001.	68111.	59813.	0.8600	0.0935
E	12.	123839.	102231.	219447.	9463.	35550.	153001.	68448.	59813.	0.8600	0.0935
F	12.	109354.	102223.	219447.	5730.	0.	162231.	53274.	57730.	0.8600	0.0935
G	12.	122554.	103601.	219447.	6700.	27668.	155933.	65511.	59040.	0.8600	0.0935
H	12.	120407.	100385.	196329.	144463.	96668.	81717.	74612.	45795.	0.8600	0.0935
I	12.	140744.	100385.	219447.	101682.	35550.	144835.	74612.	66132.	0.8600	0.1192
J	12.	137919.	100385.	219447.	98257.	35550.	144835.	74612.	63307.	0.8778	0.0935
J	12.	125770.	100385.	219447.	6700.	35550.	144835.	74612.	51158.	0.9654	0.0641

FIG. C-1 (Continued)

SEA DUTY TOUR	SHCRE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SCORE	FIRST TERM SEA	CAREER SEA	CAREER SCORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
A 20	6	125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
B 20	6	116394	174371	219447	71320	164835	144835	74612	47825	0.8600	0.0935
C 20	6	125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
D 20	6	120407	180325	219447	77501	35550	144835	74612	42550	0.8600	0.0935
E 20	6	118868	174020	219447	77501	0	144835	74612	42550	0.8600	0.0935
F 20	6	104239	156164	219447	66708	0	144835	74612	42550	0.8600	0.0935
G 20	6	122354	180325	219447	66708	44506	139095	80352	42202	0.8600	0.0935
H 20	6	120407	180325	219447	66708	11309	144835	74612	42550	0.8600	0.0935
I 20	6	115398	180325	219447	78334	35550	144835	74612	40786	0.8600	0.0935
J 20	6	115911	180325	219447	76649	35550	144835	74612	41299	0.8600	0.0935
		125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.1621
USER INPUTS											
A 20	9	125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
B 20	9	120828	180116	219447	82397	36181	144835	74612	46216	0.8600	0.0935
C 20	9	125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
D 20	9	120407	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
E 20	9	125368	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
F 20	9	105898	156648	219447	45099	0	144835	74612	45099	0.8600	0.0935
G 20	9	125353	180325	219447	66708	40363	144835	74612	49345	0.8600	0.0935
H 20	9	120407	180325	219447	66708	37091	144835	74612	42795	0.8600	0.0935
I 20	9	120947	180325	219447	66708	35550	144835	74612	48335	0.8600	0.0935
J 20	9	120087	180325	219447	66708	35550	144835	74612	48275	0.8600	0.0935
		125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.1127
USER INPUTS											
A 20	16	125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
B 20	16	123108	180427	219447	91008	42592	144835	74612	50496	0.8600	0.0935
C 20	16	125770	180419	222758	91431	40273	144835	74612	51156	0.8600	0.0935
D 20	16	120407	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
E 20	16	122154	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
F 20	16	107485	161027	219447	45099	0	144835	74612	45099	0.8600	0.0935
G 20	16	122554	180325	219447	66708	36420	144835	74612	50288	0.8600	0.0935
H 20	16	120407	180325	219447	66708	36420	144835	74612	50288	0.8600	0.0935
I 20	16	125594	180325	219447	66708	35550	144835	74612	51929	0.8600	0.0935
J 20	16	125841	180325	219447	66708	35550	144835	74612	51229	0.8600	0.0935
		125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0930
USER INPUTS											
A 20	11	125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
B 20	11	125231	180113	219447	66708	48778	144835	74612	54678	0.8600	0.0935
C 20	11	125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
D 20	11	120407	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
E 20	11	123753	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
F 20	11	109323	163302	219447	32680	0	144835	74612	32680	0.8600	0.0935
G 20	11	122554	180325	219447	66708	32666	144835	74612	54678	0.8600	0.0935
H 20	11	120407	180325	219447	66708	32666	144835	74612	54678	0.8600	0.0935
I 20	11	132345	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
J 20	11	130774	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935
		125770	180325	219447	66708	35550	144835	74612	51156	0.8600	0.0935

FIG. C-1 (Continued)

SEA DUTY TOUR	SPARE TCLP	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEP	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
A	20	125770	100365	219447	66708	35550	144835	74612	51158	0-8600	0-0315
B	20	133222	199863	219447	113358	54748	144835	74612	58610	0-8600	0-0315
C	20	125770	100365	187337	124832	75675	112745	74612	51158	0-8600	0-0315
D	20	120407	100365	209446	96946	35550	144835	65011	53396	0-8600	0-0315
E	20	125239	100365	219447	91117	35550	152075	67372	57887	0-8600	0-0315
F	20	110658	165481	219447	54492	0	165481	53966	56492	0-8600	0-0315
G	20	122553	100365	219447	28708	25071	155511	64936	57617	0-8600	0-0315
H	20	120407	100365	164261	136331	90716	89649	74612	45795	0-8600	0-0315
I	20	130108	100365	219447	95126	35550	144835	74612	63376	0-8600	0-1773
J	20	135489	100365	219447	91627	35550	144835	74612	61977	0-8758	0-0315
	20	125770	100365	219447	66708	35550	144835	74612	51158	0-9459	0-0377

FIG. C-1 (Continued)

SEA SHORE CUTY DUTY TOUR TEMP	SEA SHORE CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
12	125776	183365	219447	84708	35550	144835	74612	51158	0-8500	0-C935
9	133774	196662	219447	111408	54827	144835	74612	51158	0-8500	0-C935
12	139304	206958	219447	125448	64154	144835	74612	51158	0-8500	0-C935
12	145208	217989	219447	140250	73154	144835	74612	51158	0-8500	0-C935
12	151305	226675	219447	155538	81840	144835	74612	51158	0-8500	0-C935
12	156900	235156	219447	171508	90211	144835	74612	51158	0-8500	0-C935
13	162999	244755	219447	187372	99200	144835	74612	51158	0-8500	0-C935
13	169777	254752	219447	203992	107237	144835	74612	51158	0-8500	0-C935
13	177500	265160	219447	221416	115255	144835	74612	51158	0-8500	0-C935
13	185276	276184	219447	239638	123415	144835	74612	51158	0-8500	0-C935
14	193106	287828	219447	258771	131718	144835	74612	51158	0-8500	0-C935
14	201000	299993	219447	278828	140165	144835	74612	51158	0-8500	0-C935
14	208958	312680	219447	299821	148757	144835	74612	51158	0-8500	0-C935
15	216981	325888	219447	321662	157494	144835	74612	51158	0-8500	0-C935
15	225069	339617	219447	344463	166377	144835	74612	51158	0-8500	0-C935
16	233222	353866	219447	368226	175408	144835	74612	51158	0-8500	0-C935
16	241441	368635	219447	392953	184587	144835	74612	51158	0-8500	0-C935
16	249726	383934	219447	418656	193916	144835	74612	51158	0-8500	0-C935
17	258077	399663	219447	445335	203397	144835	74612	51158	0-8500	0-C935
17	266494	415922	219447	472990	213032	144835	74612	51158	0-8500	0-C935
17	274977	432711	219447	501619	222823	144835	74612	51158	0-8500	0-C935
18	283526	449930	219447	531214	232770	144835	74612	51158	0-8500	0-C935
18	292141	467679	219447	561777	242875	144835	74612	51158	0-8500	0-C935
18	300822	485958	219447	593310	253130	144835	74612	51158	0-8500	0-C935
19	309569	504667	219447	625814	263537	144835	74612	51158	0-8500	0-C935
19	318382	523896	219447	659289	274098	144835	74612	51158	0-8500	0-C935
19	327261	543645	219447	693734	284815	144835	74612	51158	0-8500	0-C935
20	336206	563914	219447	729149	295688	144835	74612	51158	0-8500	0-C935
20	345217	584703	219447	765534	306709	144835	74612	51158	0-8500	0-C935
20	354294	606012	219447	802889	317888	144835	74612	51158	0-8500	0-C935
20	363437	627841	219447	841314	329227	144835	74612	51158	0-8500	0-C935
20	372646	650190	219447	880819	340727	144835	74612	51158	0-8500	0-C935
20	381921	673059	219447	921404	352388	144835	74612	51158	0-8500	0-C935
20	391262	696448	219447	963079	364211	144835	74612	51158	0-8500	0-C935
20	400669	720367	219447	1005854	376196	144835	74612	51158	0-8500	0-C935
20	410142	744816	219447	1050039	388443	144835	74612	51158	0-8500	0-C935
20	419681	769795	219447	1095734	400852	144835	74612	51158	0-8500	0-C935
20	429286	795304	219447	1142939	413423	144835	74612	51158	0-8500	0-C935
20	438957	821343	219447	1191654	426156	144835	74612	51158	0-8500	0-C935
20	448694	847912	219447	1241879	439051	144835	74612	51158	0-8500	0-C935
20	458497	875011	219447	1293614	452106	144835	74612	51158	0-8500	0-C935
20	468366	902640	219447	1346859	465321	144835	74612	51158	0-8500	0-C935
20	478299	930899	219447	1401614	478696	144835	74612	51158	0-8500	0-C935
20	488297	959678	219447	1457879	492231	144835	74612	51158	0-8500	0-C935
20	498350	989077	219447	1515654	505936	144835	74612	51158	0-8500	0-C935
20	508459	1019086	219447	1574939	519801	144835	74612	51158	0-8500	0-C935
20	518624	1049705	219447	1635734	533826	144835	74612	51158	0-8500	0-C935
20	528845	1080934	219447	1698039	548011	144835	74612	51158	0-8500	0-C935
20	539122	1112773	219447	1761854	562356	144835	74612	51158	0-8500	0-C935
20	549455	1145222	219447	1827179	576861	144835	74612	51158	0-8500	0-C935
20	559844	1178281	219447	1894014	591526	144835	74612	51158	0-8500	0-C935
20	570289	1211950	219447	1962359	606351	144835	74612	51158	0-8500	0-C935
20	580790	1246229	219447	2032214	621336	144835	74612	51158	0-8500	0-C935
20	591347	1281118	219447	2103579	636481	144835	74612	51158	0-8500	0-C935
20	601960	1316617	219447	2176454	651786	144835	74612	51158	0-8500	0-C935
20	612629	1352726	219447	2250839	667251	144835	74612	51158	0-8500	0-C935
20	623354	1389445	219447	2326734	682876	144835	74612	51158	0-8500	0-C935
20	634135	1426774	219447	2404139	698661	144835	74612	51158	0-8500	0-C935
20	644972	1464713	219447	2483054	714606	144835	74612	51158	0-8500	0-C935
20	655865	1503262	219447	2563479	730711	144835	74612	51158	0-8500	0-C935
20	666814	1542431	219447	2645414	746976	144835	74612	51158	0-8500	0-C935
20	677819	1582220	219447	2728859	763401	144835	74612	51158	0-8500	0-C935
20	688880	1622629	219447	2813814	780086	144835	74612	51158	0-8500	0-C935
20	699997	1663658	219447	2900279	796931	144835	74612	51158	0-8500	0-C935
20	711170	1705307	219447	2988254	813936	144835	74612	51158	0-8500	0-C935
20	722400	1747576	219447	3077739	831101	144835	74612	51158	0-8500	0-C935
20	733687	1790465	219447	3168734	848426	144835	74612	51158	0-8500	0-C935
20	745032	1833974	219447	3261239	865911	144835	74612	51158	0-8500	0-C935
20	756435	1878103	219447	3355254	883556	144835	74612	51158	0-8500	0-C935
20	767896	1922852	219447	3450779	901361	144835	74612	51158	0-8500	0-C935
20	779415	1968221	219447	3547814	919326	144835	74612	51158	0-8500	0-C935
20	790992	2014210	219447	3646359	937451	144835	74612	51158	0-8500	0-C935
20	802627	2060719	219447	3746414	955736	144835	74612	51158	0-8500	0-C935
20	814320	2108248	219447	3847979	974181	144835	74612	51158	0-8500	0-C935
20	826071	2156897	219447	3951054	992796	144835	74612	51158	0-8500	0-C935
20	837880	2206666	219447	4055639	1017571	144835	74612	51158	0-8500	0-C935
20	849747	2257561	219447	4161734	1042506	144835	74612	51158	0-8500	0-C935
20	861672	2309580	219447	4269339	1067601	144835	74612	51158	0-8500	0-C935
20	873655	2362723	219447	4378454	1092856	144835	74612	51158	0-8500	0-C935
20	885696	2416990	219447	4489079	1118271	144835	74612	51158	0-8500	0-C935
20	897795	2472381	219447	4601214	1143846	144835	74612	51158	0-8500	0-C935
20	909952	2528896	219447	4714859	1169581	144835	74612	51158	0-8500	0-C935
20	922167	2586535	219447	4830014	1195476	144835	74612	51158	0-8500	0-C935
20	934440	2645298	219447	4946679	1221531	144835	74612	51158	0-8500	0-C935
20	946771	2705185	219447	5064854	1247746	144835	74612	51158	0-8500	0-C935
20	959160	2766196	219447	5184539	1274121	144835	74612	51158	0-8500	0-C935
20	971607	2828331	219447	5305734	1300656	144835	74612	51158	0-8500	0-C935
20	984112	2891590	219447	5428439	1327351	144835	74612	51158	0-8500	0-C935
20	996675	2955973	219447	5552654	1354206	144835	74612	51158	0-8500	0-C935
20	1014296	3021480	219447	5678379	1381221	144835	74612	51158	0-8500	0-C935
20	1031965	3088111	219447	5805614	1408396	144835	74612	51158	0-8500	0-C935
20	1049692	3155866	219447	5934359	1435731	144835	74612	51158	0-8500	0-C935
20	1067477	3224741	219447	6064614	1463226	144835	74612	51158	0-8500	0-C935
20	1085320	3294736	219447	6196379	1490881	144835	74612	51158	0-8500	0-C935
20	1103221	3365851	219447	6329654	1518696	144835	74612	51158	0-8500	0-C935
20	1121180	3438086	219447	6464439	1546671	144835	74612	51158	0-8500	0-C935
20	1139197	3511441	219447	6600734	1574806	144835	74612	51158	0-8500	0-C935
20	1157272	3585916	219447	6738539	1603101	144835	74612	51158	0-8500	0-C935
20	1175405	3661511	219447	6877854	1631556	144835	74612	51158	0-8500	0-C935
20	1193596	3738226	219447	7018679	1660171	144835	74612	51158	0-8500	0-C935
20	1211845	3816061	219447	7161014	1688946	144835	74612	51158	0-8500	0-C935
20										

SEA DUTY TOUR	SMORE TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTICA
12	8	125770	163365	219447	66706	35550	144835	74612	51158	0-8600	0-0935
12	9	125770	164420	174116	146706	48916	99504	74612	51158	0-8600	0-0935
12	10	125770	164419	144464	169722	185672	69852	74612	51158	0-8600	0-0935
12	11	125770	164419	120788	193401	142243	46176	74612	51158	0-8600	0-0935
12	12	125770	164419	101458	217133	165713	26846	74612	51158	0-8600	0-0935
12	13	125770	164419	83387	242603	177645	10775	74612	51158	0-8600	0-0935
12	14	125770	164419	193899	120291	69133	119287	74612	51158	0-8600	0-0935
12	15	125770	164419	164246	145944	88784	89639	74612	51158	0-8600	0-0935
12	16	125770	164419	140522	172618	124600	65960	74612	51158	0-8600	0-0935
12	17	125770	164419	121211	192948	141790	46629	74612	51158	0-8600	0-0935
12	18	125770	164419	101458	217133	157462	30554	74612	51158	0-8600	0-0935
12	19	125770	164419	83387	242603	52222	138198	74612	51158	0-8600	0-0935
12	20	125770	164419	181548	133311	61871	105548	74612	51158	0-8600	0-0935
12	21	125770	164419	157462	172618	165519	82870	74612	51158	0-8600	0-0935
12	22	125770	164419	138152	192948	124880	63440	74612	51158	0-8600	0-0935
12	23	125770	164419	120788	193401	159351	150810	74612	51158	0-8600	0-0935
12	24	125770	164419	225422	82767	36093	120115	74612	51158	0-8600	0-0935
12	25	125770	164419	193771	112418	87260	121159	74612	51158	0-8600	0-0935
12	26	125770	164419	172618	142094	50936	97483	74612	51158	0-8600	0-0935
12	27	125770	164419	152765	162422	102567	70153	74612	51158	0-8600	0-0935
12	28	125770	164419	136691	174496	128338	62481	74612	51158	0-8600	0-0935
12	29	125770	164419	238168	76021	248631	163550	74612	51158	0-8600	0-0935
12	30	125770	164419	206517	105673	54513	133708	74612	51158	0-8600	0-0935
12	31	125770	164419	184641	123345	81911	112729	74612	51158	0-8600	0-0935
12	32	125770	164419	165510	146879	97521	98938	74612	51158	0-8600	0-0935
12	33	125770	164419	249377	64613	113655	174765	74612	51158	0-8600	0-0935
12	34	125770	164419	219725	94664	43306	145113	74612	51158	0-8600	0-0935
12	35	125770	164419	196449	118140	66942	124437	74612	51158	0-8600	0-0935
12	36	125770	164419	178719	137470	86312	102107	74612	51158	0-8600	0-0935
12	37	125770	164419	160640	151542	102388	86036	74612	51158	0-8600	0-0935
12	38	125770	164419	259366	54885	3721	148692	74612	51158	0-8600	0-0935
12	39	125770	164419	228651	64537	33573	155041	74612	51158	0-8600	0-0935
12	40	125770	164419	205971	102212	5154	131865	74612	51158	0-8600	0-0935
12	41	125770	164419	186647	127543	76355	112035	74612	51158	0-8600	0-0935
12	42	125770	164419	170575	143814	92456	95763	74612	51158	0-8600	0-0935
12	43	125770	164419	268151	46337	-3122	193741	74612	51158	0-8600	0-0935
12	44	125770	164419	238522	75887	24529	163890	74612	51158	0-8600	0-0935
12	45	125770	164419	214626	95163	48205	140214	74612	51158	0-8600	0-0935
12	46	125770	164419	195498	114894	62516	120804	74612	51158	0-8600	0-0935
12	47	125770	164419	178420	134265	43607	104812	74612	51158	0-8600	0-0935
12	48	125770	164419	276268	111005	-1354	261674	74612	51158	0-8600	0-0935
12	49	125770	164419	246431	67155	16597	171822	74612	51158	0-8600	0-0935
12	50	125770	164419	222758	91411	40271	148146	74612	51158	0-8600	0-0935
12	51	125770	164419	201521	103661	59601	128816	74612	51158	0-8600	0-0935
12	52	125770	164419	187357	128931	75673	112745	74612	51158	0-8600	0-0935

GIVES CAREER SEA BILLETS, CAREER SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEM FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR FIRST-TERM SHORE BILLETS AND FIRST-TERM SEA BILLETS

FIG. C-1 (Continued)

SEA CITY TOUR	SCORE CITY TELP	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SCORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
125770	180325	219447	66708	35550	144835	76612	51152	0-8600	0-8600	0-8600	0-8600
126401	180325	206853	61129	35550	144835	54579	54579	0-8600	0-8600	0-8600	0-8600
126401	180325	206853	61129	35550	144835	82013	54579	0-8600	0-8600	0-8600	0-8600
126401	180325	203376	57416	35550	144835	26741	61096	0-8600	0-8600	0-8600	0-8600
126401	180325	202529	103983	35550	144835	25213	61096	0-8600	0-8600	0-8600	0-8600
126401	180325	177356	102436	35550	144835	52563	52563	0-8600	0-8600	0-8600	0-8600
126401	180325	226957	80095	35550	144835	84057	36350	0-8600	0-8600	0-8600	0-8600
126401	180325	266852	51500	35550	144835	37600	62968	0-8600	0-8600	0-8600	0-8600
126401	180325	205386	93398	35550	144835	37448	62968	0-8600	0-8600	0-8600	0-8600
126401	180325	202279	95113	35550	144835	34557	62968	0-8600	0-8600	0-8600	0-8600
126401	180325	199392	102400	35550	144835	69751	31705	0-8600	0-8600	0-8600	0-8600
126401	180325	214537	86225	35550	144835	85721	34804	0-8600	0-8600	0-8600	0-8600
126401	180325	210758	50034	35550	144835	85721	34804	0-8600	0-8600	0-8600	0-8600
126401	180325	207311	93481	35550	144835	62476	34804	0-8600	0-8600	0-8600	0-8600
126401	180325	204356	56836	35550	144835	59121	61000	0-8600	0-8600	0-8600	0-8600
126401	180325	201259	95535	35550	144835	56428	61000	0-8600	0-8600	0-8600	0-8600
126401	180325	216210	84582	35550	144835	71375	45632	0-8600	0-8600	0-8600	0-8600
126401	180325	212461	65311	35550	144835	52781	56212	0-8600	0-8600	0-8600	0-8600
126401	180325	209030	91762	35550	144835	64155	56212	0-8600	0-8600	0-8600	0-8600
126401	180325	205878	94513	35550	144835	61044	56212	0-8600	0-8600	0-8600	0-8600
126401	180325	217736	83556	35550	144835	78901	47506	0-8600	0-8600	0-8600	0-8600
126401	180325	214020	86772	35550	144835	69195	47506	0-8600	0-8600	0-8600	0-8600
126401	180325	210628	90184	35550	144835	65773	54634	0-8600	0-8600	0-8600	0-8600
126401	180325	217487	93125	35550	144835	62632	57775	0-8600	0-8600	0-8600	0-8600
126401	180325	214565	56227	35550	144835	59730	60777	0-8600	0-8600	0-8600	0-8600
126401	180325	219132	85669	35550	144835	74297	46110	0-8600	0-8600	0-8600	0-8600
126401	180325	215452	83340	35550	144835	70617	49790	0-8600	0-8600	0-8600	0-8600
126401	180325	212062	87730	35550	144835	67227	53180	0-8600	0-8600	0-8600	0-8600
126401	180325	206935	54757	35550	144835	61209	56310	0-8600	0-8600	0-8600	0-8600
126401	180325	218932	91869	35550	144835	64098	59027	0-8600	0-8600	0-8600	0-8600
126401	180325	216770	84022	35550	144835	71958	44827	0-8600	0-8600	0-8600	0-8600
126401	180325	213466	83168	35550	144835	66508	51818	0-8600	0-8600	0-8600	0-8600
126401	180325	210289	50428	35550	144835	62564	54553	0-8600	0-8600	0-8600	0-8600
126401	180325	207398	63354	35550	144835	62564	57844	0-8600	0-8600	0-8600	0-8600
126401	180325	213596	78186	35550	144835	70761	43646	0-8600	0-8600	0-8600	0-8600
126401	180325	217387	63885	35550	144835	73151	47555	0-8600	0-8600	0-8600	0-8600
126401	180325	216666	64148	35550	144835	69811	50596	0-8600	0-8600	0-8600	0-8600
126401	180325	215187	81148	35550	144835	68711	53185	0-8600	0-8600	0-8600	0-8600
126401	180325	212656	91120	35550	144835	66831	56876	0-8600	0-8600	0-8600	0-8600
126401	180325	226887	71205	35550	144835	72853	42555	0-8600	0-8600	0-8600	0-8600
126401	180325	218764	21876	35550	144835	71278	46120	0-8600	0-8600	0-8600	0-8600
126401	180325	215799	84995	35550	144835	70866	59163	0-8600	0-8600	0-8600	0-8600
126401	180325	212717	80775	35550	144835	67804	52350	0-8600	0-8600	0-8600	0-8600
126401	180325	209646	90946	35550	144835	65011	53596	0-8600	0-8600	0-8600	0-8600

GENERAL FIRST-TERM SCORE BILLETS, FIRST-TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE BILLETS

FIG. C-1 (Continued)

THIS PAGE IS BEST QUALITY PRACTICABLE FROM COPY FURNISHED TO DDC

SEA CUBIT TOUR	SCORE CUBIT TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ABOARD	FIRST TERM SCORE	FIRST TERM SEA	CAREER SEA	CAREER SCORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
1.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
2.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
3.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
4.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
5.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
6.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
7.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
8.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
9.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
10.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
11.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
12.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
13.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
14.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
15.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
16.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
17.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
18.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
19.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935
20.	125776	180325	219447	219447	219447	35550	144835	74612	51158	0-8600	0-0935

GIVEN FIRST-TERM SCORE BILLETS, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEM FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SCORE BILLETS

FIG. C-1 (Continued)

SEA DUTY TOUR	SHORE CLTY TCLR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	ACTUAL ASGREQ	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
123770		123770	180325	215447	66708	35550	164835	74616	51158	0-8600	0-0935
109091	8	109091	163442	219447	51082	0	163442	56095	53092	0-8600	0-0935
110979	9	110979	166261	219447	57793	0	166261	51106	57793	0-8600	0-0935
112739	10	112739	162898	219447	62190	0	162898	50549	62190	0-8600	0-0935
114128	11	114128	171168	219447	63039	0	171168	40079	66309	0-8600	0-0935
115335	12	115335	173885	219447	70173	0	173885	43752	70173	0-8600	0-0935
108245	6	108245	162163	219447	50561	0	162163	57293	50961	0-8600	0-0935
111095	9	111095	164337	219447	55285	0	164337	54510	55285	0-8600	0-0935
111814	10	111814	169341	219447	60211	0	169341	51906	59928	0-8600	0-0935
113668	11	113668	169950	219447	64011	0	169950	49457	64011	0-8600	0-0935
115066	12	115066	172295	219447	67854	0	172295	47152	67854	0-8600	0-0935
107883	8	107883	161254	219447	48060	0	161254	58423	49360	0-8600	0-0935
109106	9	109106	163752	219447	53698	0	163752	53699	53699	0-8600	0-0935
111126	10	111126	168122	219447	57858	0	168122	53122	57858	0-8600	0-0935
112939	11	112939	168747	219447	61539	0	168747	50706	61539	0-8600	0-0935
114167	12	114167	174237	219447	65751	0	174237	47411	65751	0-8600	0-0935
116801	8	116801	160081	219447	47155	0	160081	59446	47355	0-8600	0-0935
109592	9	109592	162553	219447	54230	0	162553	56762	51830	0-8600	0-0935
117122	10	117122	165252	219447	56140	0	165252	54225	56140	0-8600	0-0935
111686	11	111686	167622	219447	60483	0	167622	51825	60483	0-8600	0-0935
113605	12	113605	169895	219447	63658	0	169895	48551	63653	0-8600	0-0935
106186	8	106186	159080	219447	48219	0	159080	57167	45819	0-8600	0-0935
107949	9	107949	161721	219447	50223	0	161721	57728	50221	0-8600	0-0935
109626	10	109626	164254	219447	53951	0	164254	55233	54537	0-8600	0-0935
111805	11	111805	166559	219447	58351	0	166559	52868	58357	0-8600	0-0935
112710	12	112710	168954	219447	62117	0	168954	50593	62117	0-8600	0-0935
105629	8	105629	152246	219447	44428	0	152246	61231	44428	0-8600	0-0935
107365	9	107365	160845	219447	47763	0	160845	58002	48793	0-8600	0-0935
109613	10	109613	163316	219447	50868	0	163316	56131	52862	0-8600	0-0935
110561	11	110561	165666	219447	54800	0	165666	53781	56000	0-8600	0-0935
112974	12	112974	167902	219447	60292	0	167902	51545	60299	0-8600	0-0935
105123	8	105123	157488	219447	43164	0	157488	61959	43164	0-8600	0-0935
106031	9	106031	160048	219447	47432	0	160048	59199	47432	0-8600	0-0935
108460	10	108460	162456	219447	51493	0	162456	55951	51499	0-8600	0-0935
110311	11	110311	164811	219447	55375	0	164811	54816	55375	0-8600	0-0935
111490	12	111490	167028	219447	59071	0	167028	52419	59071	0-8600	0-0935
104661	8	104661	152756	219447	42010	0	152756	60129	42010	0-8600	0-0935
107952	9	107952	159318	219447	48216	0	159318	57721	48216	0-8600	0-0935
109426	10	109426	164026	219447	54066	0	164026	55421	54066	0-8600	0-0935
110954	11	110954	166223	219447	57730	0	166223	53224	57730	0-8600	0-0935
104235	8	104235	151628	219447	40954	0	151628	63885	40954	0-8600	0-0935
105898	9	105898	156648	219447	45099	0	156648	60799	45099	0-8600	0-0935
107465	10	107465	161027	219447	48665	0	161027	58420	48665	0-8600	0-0935
109005	11	109005	163702	219447	52860	0	163702	56145	52860	0-8600	0-0935
110458	12	110458	165481	219447	56492	0	165481	53966	56492	0-8600	0-0935

LINE# FIRST TERM SHORE BILLETS EQUAL TO ZERO, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS

FIG. C-1 (Continued)

SEA CUNT TCUF	SPCRE TCUF	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPCRE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
12	8	125776	180385	219447	4769	15550	164835	76112	51159	0-8600	0-0935
12	8	125407	180385	181718	15074	13279	16761	76112	45795	0-8600	0-0935
12	8	125407	180385	153176	15074	13279	40584	76112	45795	0-8600	0-0935
12	8	125407	180385	93982	20680	10115	19570	76112	45795	0-8600	0-0935
12	8	125407	180385	76678	22114	12315	5086	76112	45795	0-8600	0-0935
12	8	125407	180385	62292	23521	12706	-	76112	45795	0-8600	0-0935
12	8	125407	180385	161502	13250	53495	86890	76112	45795	0-8600	0-0935
12	8	125407	180385	134959	16283	14008	60347	76112	45795	0-8600	0-0935
12	8	125407	180385	113765	18727	14232	39193	76112	45795	0-8600	0-0935
12	8	125407	180385	96461	20433	15536	21859	76112	45795	0-8600	0-0935
12	8	125407	180385	82074	22310	17223	7462	76112	45795	0-8600	0-0935
12	8	125407	180385	378412	122380	76595	103000	76112	45795	0-8600	0-0935
12	8	125407	180385	151810	148522	103127	77258	76112	45795	0-8600	0-0935
12	8	125407	180385	130676	176116	14321	50664	76112	45795	0-8600	0-0935
12	8	125407	180385	113372	187420	141625	30760	76112	45795	0-8600	0-0935
12	8	125407	180385	58965	20167	15612	124373	76112	45795	0-8600	0-0935
12	8	125407	180385	192025	17787	61972	110413	76112	45795	0-8600	0-0935
12	8	125407	180385	166482	134310	22515	91870	76112	45795	0-8600	0-0935
12	8	125407	180385	145268	152504	169709	70676	76112	45795	0-8600	0-0935
12	8	125407	180385	127984	172008	127013	53372	76112	45795	0-8600	0-0935
12	8	125407	180385	113598	187196	141395	38286	76112	45795	0-8600	0-0935
12	8	125407	180385	25721	95021	49226	131159	76112	45795	0-8600	0-0935
12	8	125407	180385	179228	121566	75769	104616	76112	45795	0-8600	0-0935
12	8	125407	180385	156036	142758	96963	8422	76112	45795	0-8600	0-0935
12	8	125407	180385	140730	160068	11267	66118	76112	45795	0-8600	0-0935
12	8	125407	180385	126144	174468	146531	51732	76112	45795	0-8600	0-0935
12	8	125407	180385	28579	78113	18016	14327	76112	45795	0-8600	0-0935
12	8	125407	180385	19447	11325	44046	115425	76112	45795	0-8600	0-0935
12	8	125407	180385	189243	13384	55754	90511	76112	45795	0-8600	0-0935
12	8	125407	180385	171939	16453	77327	77327	76112	45795	0-8600	0-0935
12	8	125407	180385	137532	16240	17445	62940	76112	45795	0-8600	0-0935
12	8	125407	180385	269907	71680	28090	152295	76112	45795	0-8600	0-0935
12	8	125407	180385	250364	106428	56633	125756	76112	45795	0-8600	0-0935
12	8	125407	180385	191176	128622	75827	105550	76112	45795	0-8600	0-0935
12	8	125407	180385	161866	138528	53111	87256	76112	45795	0-8600	0-0935
12	8	125407	180385	187466	152112	107517	72868	76112	45795	0-8600	0-0935
12	8	125407	180385	257756	65036	19241	161144	76112	45795	0-8600	0-0935
12	8	125407	180385	269212	91579	45944	134661	76112	45795	0-8600	0-0935
12	8	125407	180385	185015	112772	66978	113497	76112	45795	0-8600	0-0935
12	8	125407	180385	170715	130277	42282	96103	76112	45795	0-8600	0-0935
12	8	125407	180385	156229	144463	56688	81717	76112	45795	0-8600	0-0935
12	8	125407	180385	243682	57104	11305	169276	76112	45795	0-8600	0-0935
12	8	125407	180385	217146	81646	37651	142534	76112	45795	0-8600	0-0935
12	8	125407	180385	195932	104240	59245	121340	76112	45795	0-8600	0-0935
12	8	125407	180385	178648	122144	76349	104330	76112	45795	0-8600	0-0935
12	8	125407	180385	164261	136331	60736	89649	76112	45795	0-8600	0-0935

GIVEN: CAREER SEA BILLETS, TOTAL FIRST-TERM BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE

.....THEN FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS AND CAREER SHORE BILLETS

FIG. C-1 (Continued)

SEA CUTY TOUF	SEA CLTY TEUP	SACRE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPCRE	FIRST TERM SCORE	FIRST TERM SEA	CAREER SEA	CAREER SHAPE	CAREER CONTINUATION	FIRST TERM RETENTION
1.	1.	125770.	180365.	219447.	87708.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.0935
1.	5.	116471.	180365.	219447.	91411.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1039
1.	10.	104491.	180365.	219447.	111811.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1125
1.	15.	93661.	180365.	219447.	131401.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1191
1.	20.	82140.	180365.	219447.	151118.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1259
1.	25.	71164.	180365.	219447.	171022.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1322
1.	30.	60284.	180365.	219447.	191222.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1382
1.	35.	49747.	180365.	219447.	211822.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1438
1.	40.	39750.	180365.	219447.	233128.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1491
1.	45.	30282.	180365.	219447.	255242.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1541
1.	50.	21426.	180365.	219447.	278176.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1588
1.	55.	13176.	180365.	219447.	301942.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1632
1.	60.	5526.	180365.	219447.	327562.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1673
1.	65.	0.	180365.	219447.	355000.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1711
2.	1.	125770.	180365.	219447.	87708.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1746
2.	5.	116471.	180365.	219447.	91411.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1778
2.	10.	104491.	180365.	219447.	111811.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1807
2.	15.	93661.	180365.	219447.	131401.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1833
2.	20.	82140.	180365.	219447.	151118.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1856
2.	25.	71164.	180365.	219447.	171022.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1876
2.	30.	60284.	180365.	219447.	191222.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1893
2.	35.	49747.	180365.	219447.	211822.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1907
2.	40.	39750.	180365.	219447.	233128.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1918
2.	45.	30282.	180365.	219447.	255242.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1926
2.	50.	21426.	180365.	219447.	278176.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1931
2.	55.	13176.	180365.	219447.	301942.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1934
2.	60.	5526.	180365.	219447.	327562.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
2.	65.	0.	180365.	219447.	355000.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	1.	125770.	180365.	219447.	87708.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	5.	116471.	180365.	219447.	91411.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	10.	104491.	180365.	219447.	111811.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	15.	93661.	180365.	219447.	131401.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	20.	82140.	180365.	219447.	151118.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	25.	71164.	180365.	219447.	171022.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	30.	60284.	180365.	219447.	191222.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	35.	49747.	180365.	219447.	211822.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	40.	39750.	180365.	219447.	233128.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	45.	30282.	180365.	219447.	255242.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	50.	21426.	180365.	219447.	278176.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	55.	13176.	180365.	219447.	301942.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	60.	5526.	180365.	219447.	327562.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935
3.	65.	0.	180365.	219447.	355000.	35350.	144035.	74612.	51158.	0.8600	0.8600	0.1935

.....TIME FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

.....TIME FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

.....TIME FOR THE VARIOUS ROTATION PATTERNS ABOVE.....AND A BALANCED SYSTEM

FIG. C-1 (Continued)

SEA DUTY TOUR	SMCRE TELF	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPCRE	FIRST TERM SHOPE	FIRST TERM SE/	CAREER SEA	CAREER SMCRE	CAREER CONTINUATION	FIRST TEPP RETENTION
12	6	125770	180385	219447	6760	35550	144835	74812	51158	0-8600	0-C935
13	6	135004	180385	219447	9542	35550	144835	74812	60392	0-8751	0-C935
14	6	142877	180385	219447	12165	35550	144835	74812	69130	0-8915	0-C935
15	6	149322	180385	219447	15076	35550	144835	74812	77220	0-9075	0-C935
16	6	157230	180385	219447	18168	35550	144835	74812	86128	0-9220	0-C935
17	6	164617	180385	219447	21553	35550	144835	74812	95005	0-9376	0-C935
18	6	171273	180385	219447	25211	35550	144835	74812	104051	0-9543	0-C935
19	6	178219	180385	219447	29157	35550	144835	74812	113277	0-9720	0-C935
20	6	185452	180385	219447	33409	35550	144835	74812	122704	0-9919	0-C935
21	6	192970	180385	219447	37978	35550	144835	74812	132450	0-1011	0-C935
22	6	199860	180385	219447	42876	35550	144835	74812	142547	0-1024	0-C935
23	6	206155	180385	219447	48114	35550	144835	74812	152912	0-1038	0-C935
24	6	211955	180385	219447	53702	35550	144835	74812	163566	0-1053	0-C935
25	6	217260	180385	219447	59650	35550	144835	74812	174529	0-1069	0-C935
26	6	222070	180385	219447	65978	35550	144835	74812	185812	0-1086	0-C935
27	6	226385	180385	219447	72706	35550	144835	74812	197447	0-1104	0-C935
28	6	230205	180385	219447	79844	35550	144835	74812	209447	0-1123	0-C935
29	6	233530	180385	219447	87402	35550	144835	74812	221812	0-1143	0-C935
30	6	236360	180385	219447	95400	35550	144835	74812	234567	0-1164	0-C935
31	6	238705	180385	219447	103858	35550	144835	74812	247812	0-1186	0-C935
32	6	240565	180385	219447	112786	35550	144835	74812	261567	0-1209	0-C935
33	6	241940	180385	219447	122184	35550	144835	74812	275912	0-1233	0-C935
34	6	242830	180385	219447	132062	35550	144835	74812	290867	0-1258	0-C935
35	6	243235	180385	219447	142440	35550	144835	74812	306412	0-1284	0-C935
36	6	243155	180385	219447	153328	35550	144835	74812	322567	0-1311	0-C935
37	6	242590	180385	219447	164736	35550	144835	74812	339312	0-1339	0-C935
38	6	241550	180385	219447	176664	35550	144835	74812	356667	0-1368	0-C935
39	6	240045	180385	219447	189122	35550	144835	74812	374712	0-1398	0-C935
40	6	238075	180385	219447	202130	35550	144835	74812	393467	0-1429	0-C935
41	6	235640	180385	219447	215708	35550	144835	74812	412912	0-1461	0-C935
42	6	232750	180385	219447	230866	35550	144835	74812	433067	0-1494	0-C935
43	6	229405	180385	219447	247604	35550	144835	74812	453912	0-1528	0-C935
44	6	225615	180385	219447	264932	35550	144835	74812	475467	0-1563	0-C935
45	6	221390	180385	219447	283860	35550	144835	74812	497712	0-1600	0-C935
46	6	216740	180385	219447	304398	35550	144835	74812	520767	0-1638	0-C935
47	6	211675	180385	219447	326556	35550	144835	74812	544612	0-1678	0-C935
48	6	206205	180385	219447	350334	35550	144835	74812	569267	0-1719	0-C935
49	6	200340	180385	219447	375742	35550	144835	74812	594712	0-1762	0-C935
50	6	194080	180385	219447	403890	35550	144835	74812	621967	0-1807	0-C935

GENERAL: FIRST-TERM SMCRE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION RATE

*****THEM FOR THE VARIOUS ROTATIONAL PATTERNS ABOVE*****AND A BALANCED SYSTEM

SOLVE FOR: CAREER SMCRE BILLETS AND CAREER CONTINUATION RATE

FIG. C-1 (Continued)

PROGRAM PARAMETERS T1= 144235.77 T2= 35550.77 S1= 74612.77 S2= 51196.77 C= 0.6600077 R= 0.09345
 T1T2= 180265.77 T1S1= 219447.77 T2S2= 86708.77 S1S2= 123770.77 A= 3.00077 B= 2.000
 PERIOD= 4.77 EPD= 0.001077 SEATIP= 5.77 SHOTIP= 0.30077 T1MIN= 101385.
 T1MAX= 180266.77 T2MIN= 24605.77 T2MAX= 46215.77 S1MIN= 52226.77 S1MAX= 96996.77 S2MIN= 35811.
 S2MAX= 68503.77 ALPHA= 1.

SUMMARY OF INPUT AND OUTPUT VARIABLES FOR LINES A-J ARE:

- A GIVES: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS, CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER SHORE BILLETS
- B GIVES: CAREER SEA BILLETS, CAREER SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLETS AND FIRST-TERM SEA BILLETS
- C GIVES: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE BILLETS
- D GIVES: FIRST-TERM SHORE BILLETS, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
- E GIVES: FIRST TERM SHORE BILLETS EQUAL TO ZERO, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
- F GIVES: TOTAL SEA BILLETS, TOTAL SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS
- G GIVES: CAREER SEA BILLETS, TOTAL FIRST-TERM BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS AND CAREER SHORE BILLETS
- H GIVES: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION RATE
 SOLVE FOR: CAREER SHORE BILLETS AND FIRST-TERM RETENTION RATE
- I GIVES: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION RATE
 SOLVE FOR: CAREER SHORE BILLETS AND CAREER CONTINUATION RATE
- J GIVES: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
 SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER CONTINUATION RATE

FIG. C-2: Sample Output - 9 User Specified Variables

SEA	SCHE	TOTAL	TOTAL	TOTAL	FIRST	CAREER	CAREER	CAREER	FIRST		
DUY	DUY	FIRST	AT	TERM	TERM	SEA	SEA	CONTINUATION	TERM		
TOUR	TOUR	TERM	SEA	SCORE	SCORE	SEA	SEA		RENTICA		
		CAREER									
USER	INPUTS	125770.	180385.	219447.	66708.	35550.	144035.	74612.	51158.	0-8600	0-0935
C	11.	125770.	180385.	219447.	66708.	35550.	144035.	74612.	51158.	0-8600	0-0935
D	12.	120407.	180385.	212697.	86038.	35550.	144035.	67862.	52345.	0-8600	0-0935
E	13.	123137.	180385.	218447.	85683.	35550.	144035.	69625.	52113.	0-8600	0-0935
F	14.	125254.	183601.	219447.	86198.	35550.	144035.	68602.	52772.	0-8600	0-0935
G	15.	131354.	180385.	219447.	92211.	35550.	144035.	74612.	56661.	0-8716	0-0935
H	16.	131273.	180385.	219447.	92211.	35550.	144035.	74612.	56661.	0-8716	0-0935
I	17.	125770.	180385.	219447.	86708.	35550.	144035.	74612.	51158.	0-9311	0-0466
USER	INPUTS	125770.	180385.	219447.	66708.	35550.	144035.	74612.	51158.	0-8600	0-0935
C	18.	120407.	180385.	208892.	91900.	35550.	144035.	64057.	56350.	0-8600	0-0935
D	19.	125703.	180385.	219447.	94574.	35550.	144035.	66679.	59024.	0-8600	0-0935
E	20.	122554.	183601.	219447.	86708.	28378.	152223.	64224.	58330.	0-8600	0-0935
F	21.	140247.	180385.	219447.	101185.	35550.	144035.	74612.	65635.	0-8600	0-1088
G	22.	122219.	180385.	219447.	91137.	35550.	144035.	74612.	63667.	0-8720	0-0935
USER	INPUTS	125770.	180385.	219447.	66708.	35550.	144035.	74612.	51158.	0-8600	0-0935
C	23.	120407.	180385.	205434.	95328.	35550.	144035.	60599.	59008.	0-8600	0-0935
D	24.	127548.	191084.	219447.	91185.	35550.	155534.	63913.	63635.	0-8600	0-0935

FIG. C-2 (Continued)

SEA DUTY TOUR	SICRE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS		125770.	180385.	219447.	26708.	35550.	144835.	74612.	51158.	0.8680	0.0935
C 12.	8.	120407.	180385.	210663.	90129.	35550.	144835.	65828.	54579.	0.8600	0.0935
D 12.	8.	124774.	186927.	219447.	92254.	35550.	151377.	68070.	56754.	0.8600	0.0935
F 12.	8.	122553.	182682.	219447.	26708.	30516.	153086.	66361.	56192.	0.8600	0.0935
M 12.	8.	116473.	180385.	219447.	97411.	35550.	144835.	74612.	61861.	0.8600	0.1059
I 12.	8.	115004.	180385.	219447.	9542.	35550.	144835.	74612.	60392.	0.8751	0.0935
J 12.	8.	125770.	180385.	219447.	26708.	35550.	144835.	74612.	51158.	0.9815	0.0129
USER INPUTS		125770.	180385.	219447.	26708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 12.	9.	120407.	180385.	206838.	91954.	35550.	144835.	62003.	58404.	0.8600	0.0935
B 12.	9.	126784.	185916.	219447.	57375.	35550.	154388.	65039.	61795.	0.8600	0.0935
F 12.	9.	122554.	183601.	219447.	26708.	26035.	157566.	61881.	60673.	0.8600	0.0935
USER INPUTS		125770.	180385.	219447.	26708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 12.	10.	120407.	180385.	203376.	97416.	35550.	144835.	58541.	61866.	0.8600	0.0935
B 12.	10.	126664.	192734.	219447.	101971.	35550.	157204.	62243.	66421.	0.8600	0.0935
USER INPUTS		125770.	180385.	219447.	26708.	35550.	144835.	74612.	51158.	0.8600	0.0935
C 12.	11.	120407.	180385.	200229.	100563.	35550.	144835.	55394.	55013.	0.8600	0.0935

FIG. C-2 (Continued)

SEA SHORE CITY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS										
C 11.	125770.	180325.	219447.	86708.	35550.	144835.	74612.	51150.	0.8660	0.6935
C 13.	120407.	180325.	202279.	92513.	35550.	144835.	57444.	62863.	0.8660	0.6935
USER INPUTS										
C 12.	125770.	180325.	219447.	86708.	35550.	144835.	74612.	51150.	0.8660	0.6935
C 13.	120407.	180325.	199392.	101404.	35550.	144835.	54537.	65000.	0.8660	0.6935
USER INPUTS										
A 14.	125770.	180325.	219447.	86708.	35550.	144835.	74612.	51150.	0.8660	0.6935
B 14.	122200.	190325.	219447.	92319.	45727.	144835.	74612.	52528.	0.8660	0.6935
C 14.	120407.	180325.	216337.	86255.	35550.	144835.	69702.	57703.	0.8660	0.6935
D 14.	122531.	183688.	219447.	87353.	35550.	144835.	71009.	51803.	0.8660	0.6935
E 14.	122531.	183688.	219447.	86708.	34952.	144835.	70797.	51752.	0.8660	0.6935
F 14.	121828.	180325.	219447.	86637.	35546.	144835.	74612.	54277.	0.8660	0.1020
G 14.	120407.	180325.	219447.	86037.	35550.	144835.	74612.	54377.	0.8660	0.6935
H 14.	125770.	180325.	219447.	86708.	35550.	144835.	74612.	51150.	0.8660	0.6935
I 14.	125770.	180325.	219447.	86708.	35550.	144835.	74612.	51150.	0.8660	0.6935
J 14.	125770.	180325.	219447.	86708.	35550.	144835.	74612.	51150.	0.8660	0.6935
USER INPUTS										
C 14.	125770.	180325.	219447.	86708.	35550.	144835.	74612.	51150.	0.8660	0.6935
D 14.	126407.	180325.	216758.	90334.	35550.	144835.	65923.	54428.	0.8660	0.6935
E 14.	126735.	186828.	219447.	92136.	35550.	151318.	60129.	58606.	0.8660	0.6935
F 14.	122531.	183688.	219447.	87208.	30226.	153076.	66371.	58182.	0.8660	0.6935
G 14.	136276.	180325.	219447.	97214.	35550.	144835.	74612.	61664.	0.8660	0.1358
H 14.	134636.	180325.	219447.	95689.	35550.	144835.	74612.	60018.	0.8660	0.6935
I 14.	125770.	180325.	219447.	86708.	35550.	144835.	74612.	51150.	0.8660	0.6935

FIG. C-2 (Continued)

SEA CUT TOLP	SEA SPECIE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPCRE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEP	CAREER SCORE	CAREER CONTINUATION	FIRST TERM RETENICH
USER INPUTS											
C 14.	10.	125770.	100385.	219447.	66708.	35550.	144835.	74612.	51158.	0.8600	0.6935
B 14.	10.	120467.	100385.	219447.	97481.	35550.	144835.	62476.	57931.	0.8600	0.6935
F 14.	10.	122536.	100385.	219447.	66708.	35550.	144835.	62254.	60360.	0.8600	0.6935
USER INPUTS											
C 14.	11.	125770.	100385.	219447.	66708.	35550.	144835.	74612.	51158.	0.8600	0.6935
B 14.	11.	120467.	100385.	219447.	97481.	35550.	144835.	59321.	61026.	0.8600	0.6935
USER INPUTS											
C 14.	12.	125770.	100385.	219447.	66708.	35550.	144835.	74612.	51158.	0.8600	0.6935
B 14.	12.	120467.	100385.	201259.	95233.	35550.	144835.	56424.	63923.	0.8600	0.6935
USER INPUTS											
A 15.	6.	125770.	100385.	219447.	66708.	35550.	144835.	74612.	51158.	0.8600	0.6935
B 15.	6.	120467.	100385.	219447.	92272.	42103.	144835.	74612.	50169.	0.8600	0.6935
C 15.	6.	125770.	100385.	225422.	66708.	37609.	150810.	74612.	51158.	0.8600	0.6935
B 15.	6.	120467.	100385.	216216.	64582.	35550.	144835.	71375.	49037.	0.8600	0.6935
F 15.	6.	122531.	100385.	219447.	66708.	35550.	144835.	72252.	49731.	0.8600	0.6935
M 15.	6.	125770.	100385.	219447.	66708.	35550.	144835.	72737.	49820.	0.8600	0.6935
J 15.	6.	120467.	100385.	219447.	66708.	35550.	144835.	74612.	51258.	0.8600	0.6935
		125770.	100385.	219447.	66708.	35550.	144835.	74612.	50738.	0.8600	0.6935
		120467.	100385.	219447.	66708.	35550.	144835.	74612.	51158.	0.8600	0.6935

FIG. C-2 (Continued)

SEA	SCORE	TOTAL	TOTAL	TOTAL	FIRST	FIRST	CAREER	CAREER	CAREER	FIRST
CUTY	TOLF	FIRST	AT	ASHORE	TERM	TERM	SEA	SHAPE	CONTINUATION	TERM
TOLF	TOLF	TERM	SEA	ASHORE	SEA	SEA	SEA	SHAPE	CONTINUATION	RETENTION
USER INPUTS										
C 15.	9.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0-8600	0-6935
D 15.	9.	126467.	212461.	88331.	35550.	144835.	67626.	52721.	0-8600	0-6935
F 15.	9.	123864.	219447.	85981.	35550.	144835.	69433.	54431.	0-8600	0-6935
H 15.	9.	122553.	219447.	85748.	32501.	151101.	68348.	54207.	0-8600	0-6935
I 15.	9.	132845.	219447.	92783.	35550.	144835.	74612.	58233.	0-8600	0-6935
J 15.	9.	133535.	219447.	92473.	35550.	144835.	74612.	56923.	0-8718	0-6935
		125776.	219447.	88708.	35550.	144835.	74612.	51158.	0-9280	0-0502
USER INPUTS										
C 15.	10.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0-8600	0-6935
D 15.	10.	130407.	208030.	81762.	35550.	144835.	64195.	56212.	0-8600	0-6935
F 15.	10.	152862.	219447.	84421.	35550.	144835.	68769.	58273.	0-8600	0-6935
H 15.	10.	167605.	219447.	87268.	28401.	152201.	64246.	58117.	0-8600	0-6935
I 15.	10.	137843.	219447.	106888.	35550.	144835.	74612.	65333.	0-8600	0-6935
J 15.	10.	137720.	219447.	98648.	35550.	144835.	74612.	63658.	0-8776	0-6935
		125776.	219447.	88708.	35550.	144835.	74612.	51158.	0-9052	0-0103
USER INPUTS										
C 15.	11.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0-8600	0-6935
D 15.	11.	120407.	205879.	84513.	35550.	144835.	61044.	59363.	0-8600	0-6935
		127325.	219447.	86626.	35550.	155196.	64249.	63676.	0-8650	0-6935
USER INPUTS										
C 15.	12.	180385.	219447.	88708.	35550.	144835.	74612.	51158.	0-8600	0-6935
D 15.	12.	126467.	202978.	87614.	35550.	144835.	58143.	62264.	0-8600	0-6935

FIG. C-2 (Continued)

SEA DUTY TOUR	SCORE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL AS-DRE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SCORE	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENT:CA
USER INPUTS												
A 1C	123770	180325	219447	219447	66700	35550	144035	51150	74612	51150	0-8670	C-6935
B 1C	123770	180325	219447	219447	66700	35550	144035	48030	74612	48030	0-8600	C-6935
C 1C	120407	180325	217236	217236	62056	35550	144035	47506	72901	47506	0-8600	C-6935
D 1C	121235	180325	219447	219447	66700	35550	144035	48030	72371	48030	0-8600	C-6935
E 1C	122554	180325	219447	219447	66700	35550	144035	48030	74511	48030	0-8600	C-6935
F 1C	123234	180325	219447	219447	66700	35550	144035	48030	74612	48030	0-8600	C-6935
G 1C	123954	180325	219447	219447	66700	35550	144035	48030	74612	48030	0-8629	C-6935
H 1C	123770	180325	219447	219447	66700	35550	144035	51150	74612	51150	0-8340	C-1150
USER INPUTS												
C 1C	123770	180325	219447	219447	66700	35550	144035	51150	74612	51150	0-8600	C-6935
D 1C	120407	180325	214026	214026	62772	35550	144035	51224	69125	51224	0-8600	C-6935
E 1C	121235	180325	219447	219447	66700	35550	144035	52664	70613	52664	0-8600	C-6935
F 1C	122554	180325	219447	219447	66700	35550	144035	52664	70187	52664	0-8600	C-6935
G 1C	123234	180325	219447	219447	66700	35550	144035	52664	74612	52664	0-8600	C-1000
H 1C	123954	180325	219447	219447	66700	35550	144035	52664	74612	52664	0-8692	C-6935
I 1C	123770	180325	219447	219447	66700	35550	144035	52664	74612	52664	0-8924	C-6935
J 1C	123770	180325	219447	219447	66700	35550	144035	51150	74612	51150	0-8600	C-6935
USER INPUTS												
C 1C	123770	180325	219447	219447	66700	35550	144035	51150	74612	51150	0-8600	C-6935
D 1C	120407	180325	219447	219447	66700	35550	144035	58274	85773	58274	0-8600	C-6935
E 1C	121235	180325	219447	219447	66700	35550	144035	58274	86092	58274	0-8600	C-6935
F 1C	122554	180325	219447	219447	66700	35550	144035	61975	74612	61975	0-8600	C-1000
G 1C	123234	180325	219447	219447	66700	35550	144035	60998	74612	60998	0-8749	C-6935
H 1C	123954	180325	219447	219447	66700	35550	144035	51150	74612	51150	0-9536	C-0324
USER INPUTS												
C 1C	123770	180325	219447	219447	66700	35550	144035	51150	74612	51150	0-8600	C-6935
D 1C	120407	180325	207487	207487	62325	35550	144035	57775	82632	57775	0-8600	C-6935
E 1C	121235	180325	219447	219447	66700	35550	144035	60991	85917	60991	0-8600	C-6935
F 1C	122554	180325	219447	219447	66700	26416	157405	62262	82262	62262	0-8600	C-6935
G 1C	123234	180325	219447	219447	66700	35550	144035	65947	74612	65947	0-8600	C-6935

FIG. C-2 (Continued)

SEA DUTY TOUR	SPARE CLTY TCUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASPCRE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
		123770.	180385.	219447.	88700.	35550.	144835.	74612.	51158.	0.8600	0.0935
C	12.	120407.	180385.	204365.	92227.	35550.	144835.	59730.	60677.	0.8600	0.0935
D	12.	118050.	191836.	219447.	104439.	35550.	156286.	63161.	64889.	0.8600	0.0935

USER INPUTS
C 12.
D 12.

FIG. C-2 (Continued)

PROGRAM PARAMETERS I1= 144235.77 I2= 35530.77 I3= 74612.77 S1= 51128.77 C= 0.8600077 R= 0.09365
 T112= 100325.77 T113= 21947.77 T122= 8708.77 S122= 123770.77 A= 3.00077 B= 2.000
 PERIOD= 4.77 EPS= 0.0001077 SEATIM= 3.77 SMO111= 0.77 PERCE= -1.00077 TIMIN= 0.
 T1P1= 9999999.77 T2P1= 0.77 SMO112= 30000.77 SIMIN= 0.77 S12459999999.77 S2411= 0.
 S2P2= 70000.77 ALPHA= 1.

SUPPORT OF INPUT AND OUTPUT VARIABLES FOR LINES A-J ARE:

- A GIVES: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS, CAREER CONTINUATION RATE, AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLETS AND CAREER SHORE BILLETS
- B GIVES: CAREER SEA BILLETS, CAREER SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLETS AND FIRST-TERM SEA BILLETS
- C GIVES: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: CAREER SEA BILLETS AND CAREER SHORE BILLETS
- D GIVES: FIRST-TERM SHORE BILLETS, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
- E GIVES: FIRST TERM SHORE BILLETS EQUAL TO ZERO, TOTAL SEA BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
- F GIVES: TOTAL SEA BILLETS, TOTAL SHORE BILLETS, CAREER CONTINUATION RATE AND FIRST TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SHORE BILLETS AND CAREER SEA BILLETS
- G GIVES: CAREER SEA BILLETS, TOTAL FIRST-TERM BILLETS, CAREER CONTINUATION RATE AND FIRST-TERM RETENTION RATE
 SOLVE FOR: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS AND CAREER SHORE BILLETS
- H GIVES: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER CONTINUATION RATE
 SOLVE FOR: CAREER SHORE BILLETS AND FIRST-TERM RETENTION RATE
- I GIVES: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND FIRST-TERM RETENTION RATE
 SOLVE FOR: CAREER SHORE BILLETS AND CAREER CONTINUATION RATE
- J GIVES: FIRST-TERM SHORE BILLETS, FIRST-TERM SEA BILLETS, CAREER SEA BILLETS AND CAREER SHORE BILLETS
 SOLVE FOR: FIRST-TERM RETENTION RATE AND CAREER CONTINUATION RATE

FIG. C-3: Sample Output - 11 User Specified Variables

SEA TOUR	SHORE CLTY	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASHORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
C	12	123770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-8600	0-0935
C	12	120407.	180385.	219447.	50189.	35550.	144835.	68026.	58779.	0-5600	0-0935
F	12	127474.	186927.	219447.	92254.	35550.	151377.	60702.	56708.	0-5600	0-0935
F	12	123097.	183442.	219447.	51082.	30316.	189086.	50095.	30982.	0-5600	0-0935
F	12	122554.	183602.	219447.	86708.	35550.	144835.	63861.	58192.	0-8600	0-0935
H	12	136473.	180385.	219447.	97411.	35550.	144835.	74612.	61861.	0-8751	0-0935
H	12	135004.	180385.	219447.	95942.	35550.	144835.	74612.	60392.	0-8751	0-0935
J	12	123776.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-9815	0-0129
USER INPUTS											
C	12	123770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-8600	0-0935
C	12	120407.	180385.	206038.	91954.	35550.	144835.	62003.	58404.	0-8600	0-0935
D	12	126724.	187326.	219447.	91275.	35550.	154388.	65059.	61725.	0-8600	0-0935
E	12	118779.	186281.	219447.	51793.	0.	166261.	53186.	57793.	0-8600	0-0935
F	12	122554.	183601.	219447.	86708.	36035.	157566.	61881.	60673.	0-8600	0-0935
I	12	142427.	180385.	219447.	103363.	35550.	144835.	74612.	67815.	0-8817	0-0935
USER INPUTS											
C	12	123770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-8600	0-0935
C	12	120407.	180385.	203376.	97418.	35550.	144835.	58541.	61466.	0-8600	0-0935
D	12	128664.	192754.	219447.	101971.	35550.	157208.	62431.	66421.	0-8600	0-0935
L	12	112735.	166456.	219447.	62194.	0.	180098.	50549.	62194.	0-8600	0-0935
F	12	122554.	183601.	219447.	86708.	21910.	161891.	57756.	64798.	0-8600	0-0935
USER INPUTS											
C	12	123770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-8600	0-0935
C	12	120407.	180385.	200229.	106563.	35550.	144835.	55394.	65613.	0-8600	0-0935
F	12	114388.	171368.	219447.	63308.	0.	171368.	58074.	64308.	0-8600	0-0935
F	12	122554.	183601.	219447.	86708.	10102.	163649.	53946.	68866.	0-8600	0-0935

FIG. C-3 (Continued)

SEA	SHCRE	TOTAL	TOTAL	TOTAL	TOTAL	FIRST	FIRST	CAREER	CAPEER	CAREER	FIRST
BUY	BUY	FIRST	FIRST	AT	TOTAL	TERM	TERM	SEA	SHCRE	CONTINUATION	TERM
TOUR	TOUR	TERM	TERM	SEA	ASHORE	SHORE	SEA				RETENTION
USER		125776.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-8600	0-0935
C	12.	120407.	180385.	197356.	101438.	35550.	144835.	52523.	67884.	0-8600	0-0935
USER		125776.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-8600	0-0935
A	13.	129999.	194735.	219447.	103308.	35550.	144835.	74612.	53187.	0-8600	0-0935
C	13.	120607.	180385.	219447.	103308.	35550.	144835.	74612.	53187.	0-8600	0-0935
D	13.	123737.	187773.	219447.	86682.	35550.	144835.	67884.	52245.	0-8600	0-0935
E	13.	108245.	162163.	219447.	59682.	35550.	144835.	52245.	50111.	0-8600	0-0935
F	13.	122554.	182661.	219447.	87708.	35550.	144835.	74612.	53187.	0-8600	0-0935
M	13.	132284.	180385.	219447.	93225.	35550.	144835.	74612.	57772.	0-8600	0-1927
I	13.	131273.	180385.	219447.	92211.	35550.	144835.	74612.	58861.	0-8716	0-0935
J	13.	125776.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-7331	0-0866
USER		125776.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-8600	0-0935
C	13.	120407.	180385.	208882.	91500.	35550.	144835.	64057.	55350.	0-8600	0-0935
D	13.	125703.	180385.	219447.	94574.	35550.	152768.	66679.	59224.	0-8600	0-0935
E	13.	110695.	144517.	219447.	55585.	0.	164937.	54510.	55885.	0-8600	0-0935
F	13.	122554.	182661.	219447.	86708.	28378.	152223.	64224.	58330.	0-8600	0-0935
M	13.	140247.	180385.	219447.	101183.	35550.	144835.	74612.	65835.	0-8600	0-1688
I	13.	138219.	180385.	219447.	95157.	35550.	144835.	74612.	63607.	0-8720	0-0935
USER		125776.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0-8600	0-0935
C	13.	120407.	180385.	203434.	92358.	35550.	144835.	60599.	59808.	0-8600	0-0935
D	13.	117248.	191084.	219447.	91183.	35550.	152534.	63913.	51435.	0-8600	0-0935
E	13.	111334.	147541.	219447.	59221.	0.	167541.	51906.	59226.	0-8600	0-0935
F	13.	122554.	182661.	219447.	86708.	24231.	152535.	60997.	62457.	0-8600	0-0935

FIG. C-3 (Continued)

SEA DUTY TOUR	SHCRE	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL AS-SCORE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS											
C 11.	11.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
D 11.	11.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
E 11.	11.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
F 11.	11.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
USER INPUTS											
C 13.	12.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
E 13.	12.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
F 13.	12.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
USER INPUTS											
A 14.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
C 14.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
D 14.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
E 14.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
F 14.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
H 14.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
I 14.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
J 14.	8.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
USER INPUTS											
C 14.	9.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
G 14.	9.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
E 14.	9.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
F 14.	9.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
H 14.	9.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
I 14.	9.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935
J 14.	9.	125770.	180385.	219447.	86708.	35550.	144835.	74612.	51158.	0.8600	0.8935

FIG. C-3 (Continued)

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AGGREGATE SEA/ShORE ROTATION MODEL (MOSES). (U)

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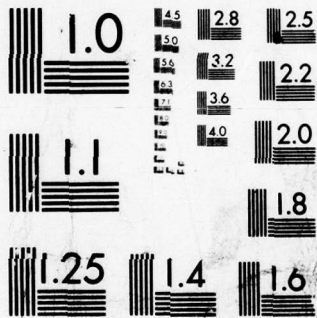
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MICROCOPY RESOLUTION TEST CHART
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SEA	SPECIE	TOTAL	TOTAL	TOTAL	TOTAL	FIRST	CAREER	FIRST	CAREER	CAREER	FIRST	
DUTY	CLTY	FIRST	AT	ASCORE	TERM	SCORE	SEA	SEA	SCORE	CONTINUATION	TERM	
TOUR	TECH	TEMP	SEA	ASCORE	SEA	SCORE	SEA	SEA	SCORE		REVERTIGA	
USER INPUTS												
C	15	123770	180385	219447	62708	35350	144035	74612	51158	6-8600	0-8935	
B	15	120407	180385	212461	62331	35350	144035	67626	52781	0-8600	0-8935	
E	15	123864	180385	219447	65581	35350	144035	69433	54431	0-8600	0-8935	
F	15	123553	180385	219447	61708	32701	151101	60762	51836	0-8600	0-8935	
H	15	132845	180385	219447	62783	35350	144035	63346	54207	0-8600	0-8935	
I	15	131533	180385	219447	62473	35350	144035	74612	56923	0-8718	0-8935	
J	15	123770	180385	219447	62708	35350	144035	74612	51158	0-9220	0-8935	
USER INPUTS												
C	15	123770	180385	219447	62708	35350	144035	74612	51158	0-8600	0-8935	
B	15	120407	180385	219447	61782	35350	144035	64195	52712	0-8600	0-8935	
E	15	130285	180385	219447	64431	35350	144035	62758	52871	0-8600	0-8935	
F	15	123553	180385	219447	62708	32401	152201	64246	54068	0-8600	0-8935	
H	15	137845	180385	219447	62708	32330	144035	74612	63131	0-8600	0-8935	
I	15	137728	180385	219447	62682	32330	144035	74612	63078	0-8778	0-8935	
J	15	123770	180385	219447	62708	35350	144035	74612	51158	0-7852	0-8935	
USER INPUTS												
C	15	123770	180385	219447	62708	35350	144035	74612	51158	0-8600	0-8935	
B	15	120407	180385	202878	60933	35350	144035	61043	59283	0-8600	0-8935	
E	15	118088	180385	219447	60883	35350	155198	64249	60778	0-8600	0-8935	
F	15	122554	180385	219447	62708	84363	187622	51823	60663	0-8600	0-8935	
I	15	143668	180385	219447	104804	35350	159339	60489	62143	0-8600	0-8935	
USER INPUTS												
C	15	123770	180385	219447	62708	35350	144035	74612	51158	0-8600	0-8935	
B	15	120407	180385	202878	60933	35350	144035	58143	62264	0-8600	0-8935	
E	15	123405	180385	219447	62833	35350	157385	61862	67586	0-8600	0-8935	
F	15	122354	180385	219447	62708	80966	169895	49551	63853	0-8600	0-8935	
								50812	63742	0-8600	0-8935	

FIG. C-3 (Continued)

SEA SPARE CUTY TOUR	TOTAL CAREER	TOTAL FIRST TERM	TOTAL AT SEA	TOTAL ASSURE	FIRST TERM SHORE	FIRST TERM SEA	CAREER SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TERM RETENTION
USER INPUTS										
A 16. C.	125770.	100365.	219447.	6708.	35550.	144035.	74612.	51158.	0.8600	0.0935
B 16. E.	122671.	102777.	219447.	6708.	38942.	144035.	74612.	48659.	0.8600	0.0935
C 16. E.	125770.	100365.	219447.	6708.	35550.	144035.	74612.	51158.	0.8600	0.0935
D 16. E.	120407.	103686.	219447.	6056.	35550.	144035.	72931.	47306.	0.8600	0.0935
E 16. E.	121235.	101626.	219447.	6214.	35550.	144035.	73371.	47824.	0.8600	0.0935
F 16. E.	106186.	150800.	219447.	4281.	35550.	144035.	60367.	43019.	0.8600	0.0935
G 16. E.	122554.	103686.	219447.	6270.	38685.	144035.	74511.	48043.	0.8600	0.0935
H 16. E.	126427.	100365.	219447.	6021.	45226.	131159.	74612.	45795.	0.8600	0.0935
I 16. E.	123234.	100365.	219447.	6172.	35550.	144035.	74612.	48222.	0.8600	0.0935
J 16. E.	122959.	100365.	219447.	6289.	35550.	144035.	74612.	48347.	0.8629	0.0935
	125770.	100365.	219447.	6708.	35550.	144035.	74612.	51158.	0.8540	0.1152
USER INPUTS										
A 16. E.	125770.	100365.	219447.	6708.	35550.	144035.	74612.	51158.	0.8600	0.0935
B 16. E.	127771.	101418.	219447.	9374.	46831.	144035.	74612.	51158.	0.8600	0.0935
C 16. E.	120407.	103686.	219447.	6056.	35550.	144035.	69145.	51122.	0.8600	0.0935
D 16. E.	121235.	101626.	219447.	6214.	35550.	144035.	70113.	52457.	0.8600	0.0935
E 16. E.	107949.	137281.	219447.	5822.	0.	163723.	57726.	50223.	0.8600	0.0935
F 16. E.	122231.	101626.	219447.	6270.	34322.	149269.	70367.	52526.	0.8600	0.0935
G 16. E.	122832.	103686.	219447.	6070.	35550.	144035.	74612.	52240.	0.8600	0.1502
H 16. E.	122653.	100365.	219447.	6289.	35550.	144035.	74612.	54333.	0.8600	0.0935
I 16. E.	125770.	100365.	219447.	6708.	35550.	144035.	74612.	51158.	0.8624	0.0935
USER INPUTS										
C 16. 10.	125770.	100365.	219447.	6708.	35550.	144035.	74612.	51158.	0.8600	0.0935
D 16. 10.	120407.	103686.	219447.	6056.	35550.	144035.	65773.	54334.	0.8600	0.0935
E 16. 10.	124822.	100365.	219447.	6270.	35550.	144035.	67998.	56824.	0.8600	0.0935
F 16. 10.	109620.	104224.	219447.	5397.	0.	162224.	55221.	54597.	0.8600	0.0935
G 16. 10.	122554.	103686.	219447.	6270.	30246.	133355.	66092.	60620.	0.8600	0.0935
H 16. 10.	126287.	100365.	219447.	6270.	35550.	144035.	74612.	61875.	0.8600	0.1060
I 16. 10.	124718.	100365.	219447.	6548.	35550.	144035.	74612.	60098.	0.8749	0.0935
J 16. 10.	125770.	100365.	219447.	6708.	35550.	144035.	74612.	51158.	0.9556	0.0324
USER INPUTS										
C 16. 11.	125770.	100365.	219447.	6708.	35550.	144035.	74612.	51158.	0.8600	0.0935
D 16. 11.	126427.	100365.	219447.	6270.	35550.	144035.	62633.	57775.	0.8600	0.0935
E 16. 11.	111805.	105519.	219447.	9511.	35550.	139310.	65517.	60961.	0.8600	0.0935
F 16. 11.	122554.	103686.	219447.	6270.	0.	165399.	52840.	58337.	0.8600	0.0935
G 16. 11.	143439.	100365.	219447.	10437.	26416.	137185.	74612.	60292.	0.8600	0.0935
H 16. 11.	140359.	100365.	219447.	10491.	35550.	144035.	74612.	68327.	0.8600	0.1113
I 16. 11.					35550.	144035.	74612.	65947.	0.8601	0.0935

FIG. C-3 (Continued)

SEA COST TICK	SPECRE		TOTAL CAREER	TOTAL FIRST TEAR	TOTAL AT SEA	TOTAL ASPCPE	FIRST TEAR SHORE	FIRST TEAR SEA	CAREER SHORE	CAREER CONTINUATION	FIRST TEAR RETENTION
	COST	TICK									
C	12.	12.	125770.	180325.	219447.	22790.	35550.	144035.	51156.	0.8600	6.0335
D	12.	12.	126467.	180325.	265365.	92227.	35550.	144035.	60677.	0.8600	6.0335
E	12.	12.	128056.	191816.	219447.	100439.	35550.	156286.	64009.	0.8600	6.0335
F	12.	12.	122710.	166854.	219447.	62117.	6.	166854.	62117.	0.8600	6.0335
F	12.	12.	122554.	183601.	219447.	21700.	22012.	160789.	63896.	0.8600	6.0335

C-40

FIG. C-3 (Continued)

APPENDIX D

THE MODEL

The aggregate model is based on a simplified description of the sea/shore rotation process. Enlisted personnel are divided into two experience categories: first-term personnel who have finished preliminary training and are serving their first sea or shore duty tour and career personnel who have completed their first duty tour. We consider two types of duty, sea and shore. At the end of their first tour, personnel who continue in the Navy are assigned to the other type of duty. Thereafter, if they stay in the Navy, they are rotated at the end of each tour to the other type of duty. This rotation is described by the respective lengths of the career sea and career shore tours, $a:b$. This process is represented in figure D-1.

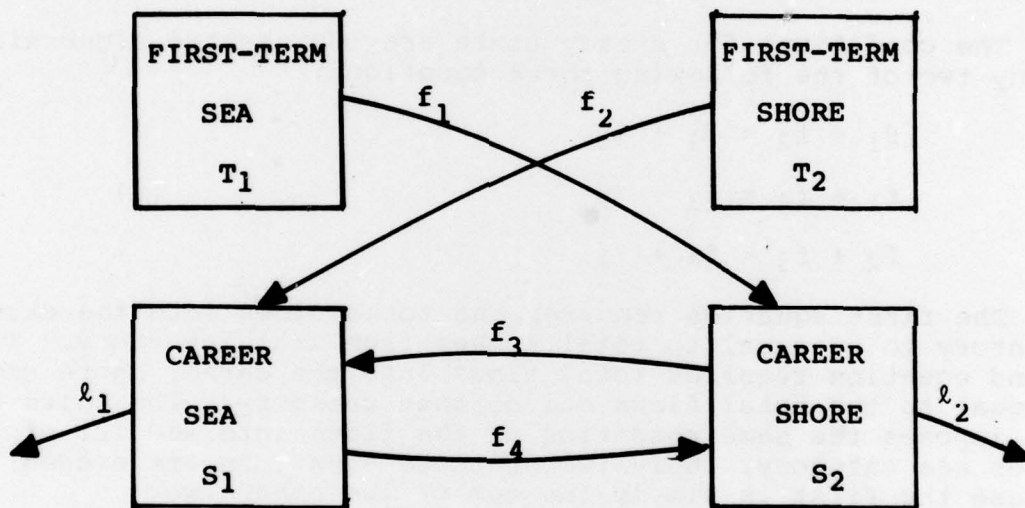


FIG. D-1: FLOW DIAGRAM

The rectangles represent the four experience duty categories and the arrows represent associated flows. The arrows labeled f_1 , f_2 , f_3 and f_4 represent continuing personnel transferred to the other type of duty. The arrows labeled l_1 and l_2 represent losses from the career force.

When flows into and out of each category are equal the number of personnel in each category remains the same. This condition is called a balanced system. In a balanced system the flows are determined by continuation behavior and the lengths of the duty tours. There is a static distribution of personnel (T_1, T_2, S_1, S_2) which results from particular continuation and rotation in a balanced system. This distribution gives the actual numbers of personnel which will be at each of the four categories if the specified continuation behavior is realized and the rotation pattern is followed. Billet requirements express the numbers of job assignments, or spaces, which are planned for each of the categories. Our model represents the relation between rotation patterns $a:b$, personnel distribution (T_1, T_2, S_1, S_2), and continuation behavior. The personnel distribution can then be compared with the billet requirements.

The conditions for steady state are represented algebraically by any two of the following three equations:

$$\begin{aligned} f_1 + f_2 &= l_1 + l_2 \\ f_1 + f_4 &= f_3 + l_2 \\ f_2 + f_3 &= f_4 + l_1 \end{aligned} \tag{1}$$

The first equation requires the total flows into the career inventory to be equal to total losses from that inventory. The second equation requires total flows into the career shore category be equal to the total flows out of that category. The third equation imposes the same condition on the flows into and out of the career sea category. Only two of these equations are needed because the first is simply the sum of the other two.

The transition behavior of first-term personnel is represented by a single parameter, r , which is the ratio of the per period flow of personnel into the career force to the total number of personnel serving their first tour. Continuation behavior for the career categories is represented by an average continuation rate, c , which is the proportion of the career personnel which are retained for one period. The computation of these parameters from the more familiar length of service continuation rates is discussed in appendix A. The formulation of the model presented in this paper assumes that the first tour for personnel assigned to sea and shore duty occurs at the same time in their career and that continuation rates are the same at both sea and shore duty. These assumptions are not essential to the analysis but make it simpler.

Using the average continuation rate c the flows of career personnel from period to period are represented in figure D-2. The horizontal arrows represent flows continuing in the Navy and the arrows pointing down represent losses. By this reasoning we see that if the per period flow into one of the career categories is f and the tour for that category is b periods, then the period flow of personnel who are transferred to the other type of duty after completing the assigned tour is $c^b f$. Since total outflows equal the inflow, losses are $(1 - c^b)f$. Applying these relations to both sea and shore categories gives the following relations:

$$f_4 = c^a(f_2 + f_3) = c^a(f_4 + l_1)$$

$$f_3 = c^b(f_1 + f_4) = c^b(f_3 + l_2).$$

Rearranging gives

$$f_4 = \frac{c^a}{1 - c^a} l_1 \quad (2)$$

$$f_3 = \frac{c^b}{1 - c^b} l_2.$$

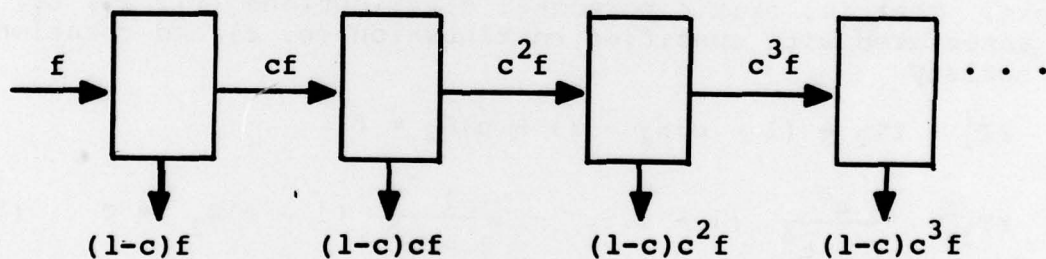


FIG. D-2: CAREER PERSONNEL FLOWS

These relations allow us to eliminate two of the variables in our balance conditions (1) by substitution. The balance conditions become:

$$f_1 + f_2 - l_1 - l_2 = 0$$

$$f_1 + \frac{c^a}{1 - c^a} l_1 - \frac{1}{1 - c^b} l_2 = 0 \quad (3)$$

$$f_2 + \frac{c^b}{1 - c^b} l_2 - \frac{1}{1 - c^a} l_1 = 0.$$

These conditions relate four flows (f_1, f_2, l_1, l_2) to the career continuation rate c and the sea/shore rotation pattern $a:b$. We are interested in the distribution of personnel, that is, the stocks which are determined by these flows. Since

$$l_1 = (1 - c)S_1$$

$$l_2 = (1 - c)S_2 \quad (4)$$

$$f_1 = rT_1$$

$$f_2 = rT_2$$

we can rewrite the conditions in terms of stocks -- steady state stocks. That is, static personnel distributions (T_1, T_2, S_1, S_2) associated with specified continuation (c, r) and rotation $a:b$ satisfy

$$rT_1 + rT_2 - (1 - c)S_1 - (1 - c)S_2 = 0$$

$$rT_1 + \frac{c^a}{1 - c^a} (1 - c)S_1 - \frac{1}{1 - c^b} (1 - c)S_2 = 0 \quad (5)$$

$$rT_2 + \frac{c^b}{1 - c^b} (1 - c)S_2 - \frac{1}{1 - c^a} (1 - c)S_1 = 0.$$

These conditions can be used to determine the balanced systems associated with particular rotation patterns. On the other hand, if a particular balanced system is desired these conditions can be used to determine what rotation pattern, or patterns, if any, will produce that distribution. As before, any two of the conditions imply the third. Therefore, we consider the model to be defined by the first two conditions:

$$r(T_1 + T_2) - (1 - c)(S_1 + S_2) = 0 \quad (6)$$

$$rT_1 + c^a \left(\frac{1 - c}{1 - c^a} \right) S_1 - \left(\frac{1 - c}{1 - c^b} \right) S_2 = 0. \quad (7)$$

The analysis of the model consists of a description of the interrelationships these equations impose on S_1 , S_2 , T_1 , T_2 , a , b , c , and r . For instance, when a rotation pattern $a:b$ and continuation behavior (c, r) are fixed, the components S_i , T_i ($i = 1, 2$) are linearly dependent, and any two can be solved for in terms of the other two. For example, given the sea billet structure, the problem of determining the number of shore billets needed for rotation exploits this linearity.

Another linear aspect of the model is equation (6), interpreted graphically as the diagonal line segment in figure D-3. The r -intercept is determined by the ratio $R = (S_1 + S_2) / (T_1 + T_2)$ of career to first-term personnel. The points (c, r) on the segment represent continuation behavior for which equation (6) is satisfied. This equation has the following interpretation: if the input to the first-term force is the same each period (i.e., $T_1 + T_2$ is in a steady state), then equation (6) is the condition which must be satisfied if the total career force $S_1 + S_2$ is also to be in a steady state. If we set $c=1$ in equation (6) then $r=0$, and so the c -intercept is always at $(1, 0)$. If continuation behavior $(c, r) \neq (1, 0)$ is specified, the value of R is completely determined by linearity. Therefore, only a billet structure for which the ratio of career billets to first-term billets is R can be filled in a first-term to career steady state with this continuation behavior.

Theoretically the values of c and r may vary between 0 and 1; however, the real world imposes practical restrictions. For example, because of attrition due to retirement, c cannot assume

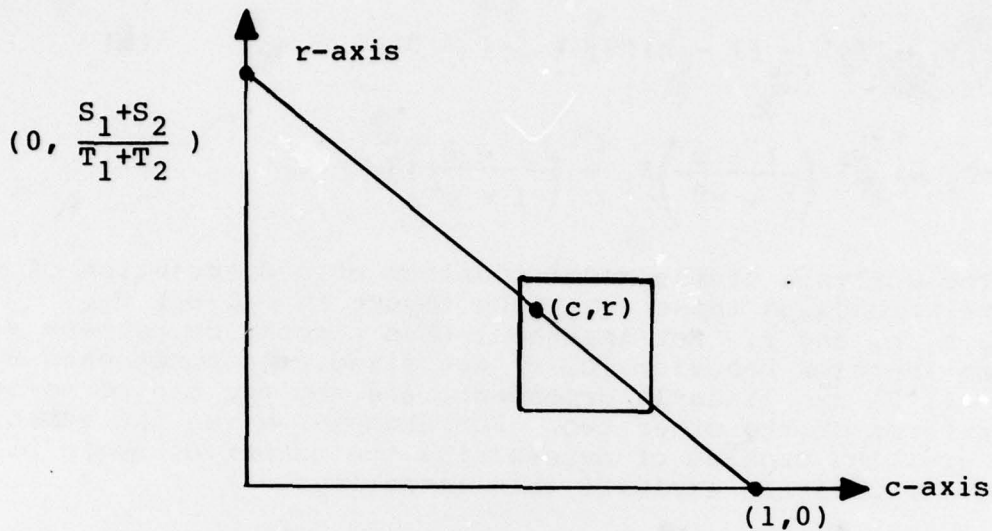


FIG. D-3: GRAPHICAL REPRESENTATION OF TOTAL FORCE STABILITY

a value too close to 1. Although the values of c and r may be affected to some extent by incentives, such as a reenlistment bonus or sea pay, the Navy cannot systematically alter them much beyond their observed values. These real world limits are indicated in the figure by a rectangular attainable region; in practice (c, r) is constrained to lie within this area. Since the first-term to career steady state systems which can be achieved are then represented by lines passing through this rectangle, the limitations on the variability of (c, r) place upper and lower bounds on R . The billet managers in Op-01 must be aware of these bounds in order to be sure that planned billet structures are feasible with respect to present continuation behavior. For example, if the line segment in figure D-3 represents the present career to first-term ratio of 125770/180385, then the point $(0.86, 0.09345)$ corresponding to current continuation¹ is found to lie well below the line. Therefore, either this ratio must be decreased or c or r increased if a steady state force is desired.

On the other hand, if the billet structure S_i, T_i ($i=1, 2$) is prescribed, then by (6) r is completely determined from c . The relations between a, b , and c as expressed in equation (7) are non-

¹Center for Naval Analyses, Memorandum (CNA)78-0226, "Sea-Shore Rotation Model, Briefing to the Advisory Committee", by Lt. John Waterman, USN, and LaVar Huntzinger, Unclassified, 23 Feb 1978.

linear and therefore more difficult to describe. The Navy's interest in finding an equitable rotation policy while filling required billets illustrates the importance of considering this aspect of the model. The purpose of the remaining paragraphs of this appendix is to describe the nature of the constraints on a , b , and c imposed by equation (7). In order to simplify the discussion, we assume that all rotation patterns satisfy the condition $a, b \geq 1$. This is a technical restriction. However, since personnel are not normally assigned to tours or less than one year's duration, and the periods of interest are years or quarters, this will always hold.

In order to express the connections between continuation and rotation, we eliminate r between equations (6) and (7) as follows. If equation (6) is multiplied by T_1 and equation (7) by $(T_1 + T_2)$ they become

$$rT_1(T_1 + T_2) = (1 - c)(S_1 + S_2)T_1$$

$$rT_1(T_1 + T_2) = (1 - c) \left[\left(\frac{1}{1-c^b} \right) S_2 - \left(\frac{c^a}{1-c^a} \right) S_1 \right] (T_1 + T_2).$$

Since $1 - c \neq 0$, equating the expressions on the righthand side gives

$$(S_1 + S_2)T_1 = \left[\left(\frac{1}{1-c^b} \right) S_2 - \left(\frac{c^a}{1-c^a} \right) S_1 \right] (T_1 + T_2).$$

This reduces to an equivalent relation $f_{a:b}(c) = 0$, where $f_{a:b}$ is the polynomial

$$f_{a:b}(x) = (S_1T_2 - S_2T_1)x^{a+b} - (S_1T_2 + S_2T_2)x^a \\ + (S_1T_1 + S_2T_1)x^b + (S_2T_2 - S_1T_1).$$

Since a fixed billet structure has been assumed, these polynomials are parameterized by the rotation pattern $a:b$. For given $a:b$ the solutions c of

$$f_{a:b}(x) = 0 \quad 0 < x < 1 \quad (8)$$

represent values of the continuation rate which are consistent with a balanced system with an $a:b$ rotation pattern. However, it

should be emphasized that a choice of a , b and c which satisfies equation (8) will provide a solution to the model only if r is determined so that it satisfies equation (6). The graphs of $y = f_{a:b}(x)$ for several rotation patterns $a:b$ are sketched in figure D-4. For these graphs it has been assumed, as is the present case for the total Navy, that $S_1T_1 > S_2T_2$; if this inequality were reversed, the graphs would be reflected about the x axis.

In order to study the solutions of equation (8), note that $f_{a:b}(c) = 0$ is equivalent to the simultaneous system

$$\begin{aligned} (S_1T_2 - S_2T_1)xy - (S_1T_2 + S_2T_2)y + (S_1T_1 + S_2T_1)x \\ + S_2T_2 - S_1T_1 = 0 \end{aligned} \quad (9)$$

$$y = x^{a/b},$$

where $x = c^b$.

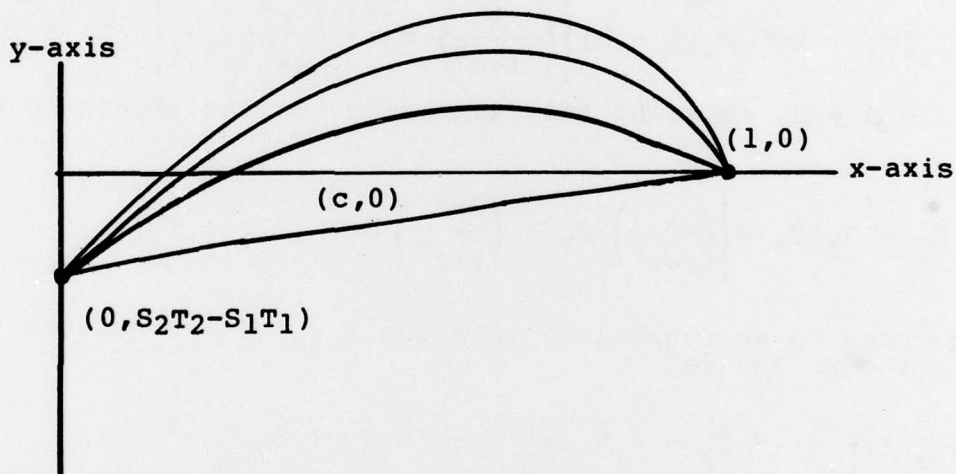


FIG. D-4: GRAPHS OF $f_{a:b}$ WHEN $S_1T_1 > S_2T_2$

The curve represented by the first of these equations is a hyperbola; hence the arc between any two points on it is convex. This curve passes through the point $(1,1)$ and is independent of $a:b$. The hyperbola is degenerate (i.e., $y=x$) if $S_1 = S_2$ and $T_1 = T_2$. In this case we shall say that the system is degenerate. By implicit differentiation,

$$\left(\frac{(S_1 T_2 + S_2 T_2) - (S_1 T_2 - S_2 T_1) x}{S_1 T_1 + S_2 T_1} \right) \frac{dy}{dx} = (S_1 T_2 - S_2 T_1) y$$

In particular, at (1,1) $dy/dx = S_1/S_2 > 0$.

In order to simplify notation, define

$$d = \begin{cases} (S_1 T_1 - S_2 T_2)/(S_1 T_1 + S_2 T_1) & \text{if } S_1 T_1 > S_2 T_2 \\ 0 & \text{if } S_1 = S_2 \text{ and } T_1 = T_2 \\ 1 & \text{if } S_1 T_1 = S_2 T_2 \text{ but } T_1 \neq T_2 \\ (S_2 T_2 - S_1 T_1)/(S_2 T_2 + S_1 T_1) & \text{if } S_1 T_1 < S_2 T_2 \end{cases}$$

then $0 < d < 1$. Suppose, for instance, that $S_2 T_2 > S_1 T_1$, then the conic passes through the point $P = (0, d)$ on the positive y-intercept, and the arc between P and $(1,1)$ represents a continuous single-valued convex function, $h(x)$. Moreover, this function is monotonically increasing on $0 < x < 1$ for $h(x)=0$ is part of a hyperbola whose asymptotes are parallel to the coordinate axes.

Clearly, $h'(1) = S_1/S_2$. Now $y = x^{a/b}$ also defines a convex arc between $(0,0)$ and $(1,1)$. It is monotonically increasing on $0 < x < 1$, and the derivative at $(1,1)$ is a/b . By the convexity, it follows that these two arcs can have at most one intersection over $0 < x < 1$, and such an intersection will occur if and only if $a/b < S_1/S_2$. Also, the y-coordinate of this point of intersection must satisfy $d < y < 1$; that is $d^{1/a} < c < 1$. If c satisfies this inequality then there is exactly one b such that $f_{a;b}(c) = 0$, for the point of intersection starts at $(1,1)$ when $a/b = S_1/S_2$ and tends monotonically to P as $b \rightarrow \infty$ (it is clear from this that the strict inequality is necessary).

Now consider the non-degenerate case in which $S_2 T_2 = S_1 T_1$. Hence the arc $h(x)$ now passes through $(0,0)$ and $(1,1)$, convexity arguments similar to the preceding ones show that there can be no non-trivial intersections unless a/b is between 1 and S_1/S_2 ; and if this condition holds, then there is exactly one intersection. However, in the degenerate case, the convexity of $y = x^{a/b}$ (where $a \neq b$) implies that there can be no non-trivial intersections; but if $a = b$, then the two arcs coincide.

The model possesses a certain symmetry, already noted in the derivation of equations (6) and (7). A moment's consideration of the diagram in figure D-1 will show that our analysis can be applied to the case $S_2T_2 < S_1T_1$ by simply replacing $(S_1, S_2, T_1, T_2, a, b)$ with $(S_2, S_1, T_2, T_1, b, a)$ throughout. These results can be summarized in the following "existence" theorem.

Theorem (1) Suppose $S_2T_2 > S_1T_1$. Then the polynomial equation $f_{a:b}(x) = 0$ has a solution c with $0 < c < 1$ if and only if $a/b < S_1/S_2$, and in this case $d^{1/a} < c < 1$. Conversely, if c lies in $d^{1/a} < c < 1$, then there is a unique b for which $f_{a:b}(c) = 0$.

(2) Suppose $S_2T_2 < S_1T_1$. Then the polynomial equation has a solution if and only if $a/b > S_1/S_2$, and in this case $d^{1/b} < c < 1$. For any c in $d^{1/b} < c < 1$ there is a unique a such that $f_{a:b}(c) = 0$.

(3) Suppose the system is non-degenerate and $S_1T_1 = S_2T_2$. Then the equation has a solution if and only if ab is strictly between 1 and S_1/S_2 . If c lies in $0 < c < 1$, then for any a there is a unique b such that $f_{a:b}(c) = 0$, and given b there is a unique a such that this equation is satisfied.

(4) Suppose the system is degenerate. Then the equation has a solution if and only if $S_2 = S_1, T_2 = T_1$ and $a = b$. In this case $f_{a:a}(x) = 0$ identically for all positive a .

These separate cases must be considered when actually solving the model for a balanced system. We will now assume that $S_2T_2 \leq S_1T_1$ since this is consistent with the total Navy as it is presently constituted. However, not all communities within the Navy satisfy this condition, and so the other cases are also important.

The theorem shows that it is not possible to attain a steady state with any rotation pattern unless the continuation rate c satisfies the inequality $d < c < 1$. On the other hand, if c is in this interval (assuming $S_2T_2 \leq S_1T_1$) there exist values of b such that

$d \frac{1}{b} < c < 1$. Using logarithms, the equation $f_{a:b}(c) = 0$ can be solved for a unique a . Thus, the model has a solution if and only if $d < c < 1$. Fractional solutions for $a:b$ are possible. For example, given a particular annual continuation rate c we might find that equation (8) was satisfied with $a = 11/4$ and $b = 13/4$. This can be interpreted as a quarterly rotation pattern of 11:13 corresponding to a quarterly continuation rate of $c^{1/4}$.

If the rotation pattern $a:b$ is given, then equation (8) can be solved for c using an approximation technique such as Newton's method. According to the analysis there is at most one solution in the interval $0 < x < 1$.

The graphical interpretation of equation (6) can now be extended to represent the entire model, including the relationship between continuation and rotation. This is indicated in figure D-5.

As before, (c,r) pairs on the diagonal represent the only possible continuation behaviors consistent with a first-term to career steady state force. The solid segment of the diagonal is determined, as shown, by d , which depends only on the billet structure, and lies in the interval $0 < d < 1$. Points on this segment represent continuation behavior for which balanced systems exist. Thus (c',r') represents an attainable continuation; and although it is consistent with a steady state force, there is no associated rotation pattern for which each of the components S_i, T_i ($i = 1,2$) would also remain in a steady state.

When the system is degenerate, the situation is different. For any continuation c the rotation patterns are exactly the $a:a$ patterns for all $a > 0$.

The rectangle in figure D-5 is the attainable region for (c,r) pairs. Points such as (c'',r'') represent continuation behavior which is consistent with a steady state billet structure for some rotation pattern; but they are not practical since they are beyond the attainable region. The only useful solutions to the model are those (c,r) pairs which lie on the solid segment but within the rectangular region.

It is clear that in figure D-5, the first-term transition rate r must satisfy the inequality $r < S_2/T_1$. Thus, the billet structure also imposes an absolute upper bound on first-term transition rates in a balanced system.

Finally, if the billet structure is allowed to vary, then d will also vary. Therefore the billet structures for which the model has a feasible solution are just those for which the solid segment, determined by d and the ratio R , intersects the attainable region.

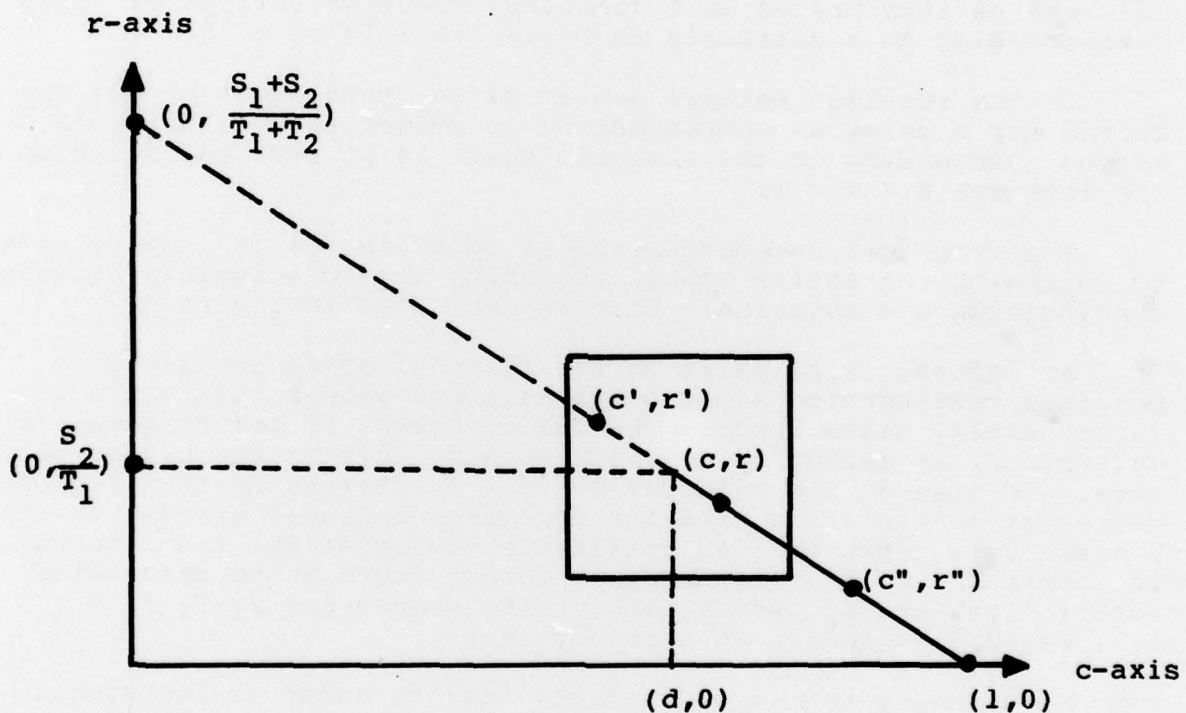


FIG. D-5: GRAPHICAL INTERPRETATION OF THE SEA/SHORE MODEL WHEN $S_1T_1 \geq S_2T_2$