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RESEARCH MEMORANDUM

ESTABLISHING THE UPPER-MENTAL-GROUP GOAL

Gary F. Johnson, Cdr., USN

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ABSTRACT

This research memorandum discusses the purpose of the upper-mental-group (UMG) requirement in Navy recruiting. A model is described that simulates the recruiting process and calculates the optimum UMG requirement. Findings are given for FY 1986.

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INTRODUCTION

In recruiting enlisted personnel, the Navy tries to balance two interests. One is the need to ensure that the mental abilities of its recruits match the demands of the jobs they will be expected to learn and perform. The second is the need to achieve efficiency in recruiting efforts by contacting as few candidates as possible to recruit the needed number. To help strike this balance, the Navy translates the prerequisites for all ratings (occupational fields) into what is termed an "upper-mental-group goal." This goal is then used by recruiters to target their efforts. It is also used for Congressional monitoring of recruit quality. Although a systematic methodology for determining the goal has not been established, the trend has been to increase the upper-mental-group (UMG) goal each year. This paper develops a procedure for establishing the UMG goal that is based upon the Navy's requirements and the availability of recruits in the youth cohort.

BACKGROUND

Recruit Ability Testing

The Armed Services Vocational Aptitude Battery (ASVAB) is administered to all candidates for enlistment in the armed forces. The Navy uses the results of the ASVAB to establish eligibility for enlistment and to classify enlistees into the various ratings. The ASVAB consists of ten tests measuring verbal, mathematical, technical, and speed factors [1]. The Navy uses composites of the ten tests to measure aptitudes for different ratings and to determine qualification for A-school, where initial occupational training takes place. Each rating requires a minimum composite score or a set of minimum composite scores.¹ The ASVAB is taken prior to enlistment, and applicants who qualify may be guaranteed a rating and an A-school before they enlist.

Navy recruiting stations are connected to a national computerized monitoring and reservation system called CLASP, which contains the qualification standards and the number of A-school seats available in each rating. After initial recruiting, a classifier, using the CLASP system, matches the potential recruit's qualifications with the Navy's needs. This procedure allows the Navy to recruit to specific requirements. For this system to work

1. The composite scores used by the Navy are detailed in appendix A.

efficiently, field recruiters must focus their efforts on the specific recruiting markets—high school graduates, for example—that are the best sources of recruits who will qualify for the openings. The Navy guides its recruiters in this effort by establishing an upper-mental-group goal. Since mental groups do not translate directly into rating entry requirements (ASVAB composite scores), it is worthwhile to review the current scheme.

Mental Groups

The Armed Forces Qualification Test (AFQT) was developed during World War II to determine the eligibility of recruits for military service. At that time, the classification testing to determine job placement was not conducted until the recruit was in basic training. Thus, it was necessary that the AFQT accurately predict performance on subsequent classification tests, and the test was structured to do so.

The mental-group categories are based on percentiles of the AFQT. There are eight mental groups (MGs) ranging from MG I to MG V. Mental group III is broken into Upper (U) and Lower (L) segments and mental group IV into A, B, and C segments. All applicants in MG I, MG II, and MG IIIU are classified as upper mental group.

The establishment of Department of Defense testing facilities in the seventies allowed administration of the ASVAB prior to enlistment, so the separate AFQT was no longer needed. The AFQT percentile is still required for mental-group classification, however, to allow Congress to monitor mental-group standards in the services. Currently, the AFQT is computed from selected ASVAB subtests and used to determine the composition of the mental groups.

Classification

Because the CLASP system that places recruits into ratings uses up-to-the-minute Navy requirements as well as composite scores, it would be a cumbersome tool for field recruiters to use. A measure that is more general, a summary ability index, is needed to provide the field recruiters with a yardstick to use in seeking out qualified applicants. Currently, this yardstick is the UMG goal, which tells the individual recruiter what percentage of his recruits must be in the upper-mental-group categories. The UMG goal requires the recruiter to focus upon markets that contain the people most

likely to meet current requirements when they go through the classification process. It is therefore important that the UMG goal be as sensitive as possible to the composite ASVAB scores the Navy requires for each rating.

Previous Work

A method of relating entry-level school requirements to ASVAB composite scores and subsequently to an upper-mental-group goal was developed at CNA [2]. Inherent to [2] was a discretionary rule for apportioning the number of school seats for each rating between upper and lower mental groups. Although the approach used was reasonable and the discretionary rule appropriate, the procedure did not adequately address the sensitivity of goal determination. Sensitivity in this context means the effect of changing the UMG goal on meeting end-strength requirements for recruits and on filling the school seats.

Since the UMG goal is at best an instrumental goal, it should be set to enhance the probability that the Navy will meet its two main recruiting objectives. The first is obtaining the required number of recruits who are qualified by their composite scores for each of the many A-schools. The second objective is meeting the end-strength requirement, in particular the total number of male recruits without military experience, known as New Accession Males (NAMs).

If the Navy sets a UMG goal that is too low, it may meet the NAM goal but fail to fill all its A-school seats. A UMG goal that is too high, on the other hand, can have a number of possible consequences, such as:

- The Navy makes its NAM goal and UMG goal. All school seats are filled with the best possible recruits. The general-detail (Gendet) population has a large number of upper-mental-group members.
- The Navy makes its UMG goal but fails to make its NAM goal. This case leaves the Navy short of its total requirements unnecessarily because qualified recruits in the lower mental groups were rejected so that the UMG goal could be met.
- The Navy does not make either goal, and as a result neither the A-school requirements nor the total requirements are met. In this

situation the Navy would be short of both the A-school graduates and the general-detail recruits needed to man the fleet.

In all cases, if the UMG goal is too high, many well-qualified, highly motivated, high school diploma graduates in the lower mental groups may be rejected for service, which would be very costly. The correct approach appears to be a narrow range of percentages, one that lies between the two extremes and satisfies both A-school and end-strength requirements.

Recruit Choice

In an all-volunteer force, it is essential that the recruiter and classifier be able to accommodate a recruit's choice of occupation. At the same time it is necessary to meet the Navy's needs for personnel skills. Although some potential recruits have a strong propensity to enlist in the Navy, most young men who want to serve in the military have not narrowed their choice down to only one of the four branches of service. If the Navy cannot offer such recruits their choice of occupation, they may well enlist in another service. From the Navy's viewpoint, someone who enlists in another branch of service is a more significant loss than someone who never intended to join any branch of military service.

Most recruits will be qualified for more than one school.¹ If the UMG goal is set too close to the minimum overall requirements, however, the recruiter's ability to place a recruit into a rating will be limited not by the availability of school seats, but by the necessity to place each recruit in the most demanding school for which he qualifies. Thus, the UMG goal should be sufficiently higher than the minimum UMG requirement to allow the recruiter the flexibility to offer recruits occupational choices.

SIMULATION MODEL

Introduction

The method selected to establish the recruit quality goal was simulation of the recruiting process. A model of the way in which recruits (including Gendets) are classified and assigned to schools was constructed using the

1. In this context, a school defines a Navy rating.

FORTTRAN programming language. The actual coding for the model is contained in appendix B. To use the model it is necessary to estimate the population of potential recruits, the number of recruits required for each particular school, and the probability of a recruit's being qualified for a particular school. The procedures used in arriving at each estimate are presented next, followed by a general description of the model.

Estimating the Population of Potential Recruits

The procedure used to estimate the population of potential recruits is outlined in table 1. We begin with projections of the number of 17- to 23-year-old males in FY 1986.¹ These estimates are based on the 1980 census [3, 4]. This total number is then divided into mental groups based on the AFQT percentiles. This procedure is possible because the AFQT is constructed to contain the same number in each percentile. The next step is to subtract all those in mental group IVB and below and the non-high school diploma graduates (NHSDGs) in mental groups IIII and IVA because the Navy does not enlist these people.

To obtain the population of potential recruits, the number remaining in each mental-group category is multiplied by that category's propensity to enlist. The propensities are based on a series of questions in the Profile of American Youth survey [1].² This calculation gives the population of 17- to 23-year-old potential recruits in each mental-group category, one of the key factors in the simulation model.

Establishing the Number of A-School Vacancies

The A-school loading plan includes quotas for New Accession Males (NAMs); these quotas must be adjusted to account for attrition from A-school. To calculate the number of seats to use in determining the composite score quotas, historical attrition rates specific to each school are used as follows:

$$\text{Loading} / (1 - \text{attrition}) = \text{Required input} .$$

1. Because the Navy has not had trouble meeting quotas for females, females were not included in the analysis.

2. Kyle Johnson of the Defense Data Manpower Center provided the tabulations of enlistment propensity by mental group.

TABLE 1

CALCULATING THE POPULATION OF POTENTIAL RECRUITS
 Male youth population: 13.4 million

Procedure	Mental-group categories			
	I/II	IIIU	IIIL	IVA
Percentage in MG	35	15	20	10
Number in MG (millions)	4.69	2.01	2.68	1.34
NHSDG percentage of MG	n/a	n/a	24.5	41.5
Number in MG (millions)	4.69	2.01	2.02	.7839
Propensity to enlist (%)	13.06	26.18	26.18	40.77
Potential recruits (thousands)	612	526	527	319

The required input is then aggregated for all schools selected by the same composite score. For example, the composite score $VE + AR = 103$ qualifies a recruit for 12 different A-schools. The required inputs for all 12 are combined to make a loading for the composite score. This procedure yields 25 separate aggregations, or rating groups, as there are 25 distinct composite score cutoffs. The summation of the 25 rating groups gives the number of NAMs that are to attend A-school. This number is subtracted from the total NAM requirement and the remainder is the quota for the "school" created for the Gendet population. As a result, the simulation will have 26 aggregations and estimate the entire NAM recruit quality result.

School Qualification Probabilities

The simulation determines qualifications for assignment to A-schools by using conditional probability: the probability that a recruit is qualified for a particular school, given that he is a member of a particular mental-group category. The probabilities are conditioned on the mental-group categories I/II, IIIU, IIIL, and IVA. The National Opinion Research Center (NORC) data base was used as the data input stream and an SPSS-X program generated the frequencies for each qualifying composite score, given the individual was in

the specified mental-group category.¹ The probabilities are detailed in appendix A.

General Description

The model generates a potential recruit and first determines which mental group he is in. The determination is probabilistic, and as such, it depends on the distribution of mental groups in the population of potential recruits. The choices are the four mental-group categories noted above. If the recruit is in the upper mental groups (I, II, IIIU) the model proceeds directly to the classification process.

Should the recruit be in the lower mental groups, the first step is to determine if the Navy's limit on MG IVAs has been reached; by Navy policy, no more than 12 percent of the recruits may be IVAs in any one year. If the limit has been reached, the individual is not recruited. If the cap has not been reached, the MG IVA recruit is treated in the same way as the MG IIIUs. For recruits in the lower mental groups, the next step is to compare the UMG goal with the percentage of recruits in the upper mental groups recruited so far. If the goal is achieved, the processing of the recruit moves to the classification step. Should the UMG goal not be achieved, the recruit is not hired.

For each mental group, the conditional probabilities have been calculated to determine the probability that the recruit is qualified for the *i*th school, given that he is a member of that mental group. For each mental group the schools are ranked from the hardest to qualify for to the easiest (Gendets in all cases). At the first school for which the recruit is qualified, the model determines if there are any vacancies. If there is one, the recruit is assigned to that school. Should there not be a vacancy, the model continues to the next school and so on. It is possible that the recruit can be rejected because all the schools for which he is qualified are full. Because the model includes Gendets, however, which all recruits are eligible to become, this type of rejection is not expected to happen often.

The model stops processing when all the requirements have been met or when 100,000 applicants have been tested. Upon completion of a run, the

1. The NORC data base comes from a nationally representative sample of American youth who were given the ASVAB battery. General results are described in [1]; [5] provides more detail on the sample.

number of recruits assigned to each school category is counted, and the percentage in the upper mental groups is determined. The number from each mental group who were rejected for service due to non-qualification or full quotas is also tallied. The final statistics are the number of recruits in the lower mental groups who were rejected due to the UMG goal and the number of MG IVAs rejected due to the cap on that mental group. Appendix C gives two examples of the model's output.

FINDINGS

The simulation model was run many times; both the random-number seed and the analytical inputs (the mental-group distribution of the population of potential recruits and the Navy's UMG goal) were varied. Each time the model was run, the number of potential recruits rejected (because of the UMG goal or because the recruit was not qualified for any of the remaining school seats) was tabulated.

From these attempts to explore the sensitivity of the model, an overall finding was that the model's output was dependent upon the definition of the population of potential recruits. In particular, changing the mental-group distributions within the recruitable population caused significant changes in the mental-group distribution of recruits. For example, even a population having only 20 percent in the upper mental groups could fill school seats—even using fairly low UMG goals. The school seats were filled, however, by *testing (and rejecting) many individuals*. The main point here is that since there is a positive probability (albeit sometimes a very small one) that a recruit in the lower mental groups can qualify for every Navy school, by testing enough people in the lower mental groups one could—*theoretically*—fill almost all the Navy schools with recruits from the lower mental groups. The testing would, of course, be prohibitively expensive, but this finding emphasized the importance of correctly defining the population of potential recruits.

As described above, the final step in defining the mental-group distribution of the population of potential recruits involved propensity to enlist: removing individuals from the pool if they indicated on the Profile of American Youth survey that they would "definitely not" or "probably not" serve in the armed forces. Thus, the percentage of the population in each mental group who indicated that they "definitely would" or "probably would" serve was multiplied by the number of people remaining in the mental group

after the earlier adjustments had been made. Although this approach (detailed in table 1) seemed correct, it was decided that since the simulation model was so sensitive to the mental-group distribution of the population of potential recruits, it would be worthwhile to explore other ways of constructing the population.

The most sensible alternative to using propensity to enlist appeared to be removing full-time college students from the population because they are not likely to enlist. The NORC data base was used to determine the percentage of full-time college students in each mental group, and another estimate of the population of potential recruits was obtained. This method produced a mental-group distribution for the population that was virtually equivalent to that detailed in table 1. The similar results of the two methods generated confidence that the population had been correctly defined.

As noted above, the model was run with several different UMG goals. Using the FY 1986 A-school loading plan and the FY 1986 projected youth cohort, the model indicated that the optimum UMG goal would be 56 or 57 percent. "Optimum" here means that the goal is high enough that school seats are filled even if all recruits do not select the most difficult school for which they qualify, but not so high as to incur excessive recruiting costs from rejecting qualified recruits in the lower mental groups. Based on repeated simulations, a UMG goal of 56 to 57 percent would yield a recruited UMG percentage of about 60 percent. Raising the UMG goal to 59 percent yields a UMG achievement of 61 percent, but 1,700 otherwise qualified recruits in the lower mental groups are turned away. At an average cost of \$330 to test a potential recruit [5], the added cost to the Navy of the higher goal (for testing alone) amounts to about \$500,000.

CONCLUSION

Thus, the conclusion of the analysis is that an upper-mental-group goal of 56 to 57 percent is optimal for FY 1986. A lower goal would sacrifice available quality, and a higher one would needlessly cause qualified people in the lower mental groups to be rejected because the overall UMG goal had not been met.

REFERENCES

- [1] Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics, *Profile of American Youth: 1980 Nationwide Administration of the Armed Services Vocational Aptitude Battery*, Mar 1982
- [2] CNA, Research Memorandum 85-2, *Determining Goals for Upper-Mental-Group Recruits*, by Gary F. Johnson and Robert F. Lockman, Feb 1985
- [3] U.S. Bureau of the Census, *Statistical Abstract of the United States, 1982-1983*, Washington, D.C. 1983
- [4] U.S. Department of Labor, *Handbook of Labor Statistics, 1983*, Washington, D.C. 1983
- [5] McWilliams, H. A., *The Profile of American Youth: Non-Technical Sampling Report*, National Opinion Research Center, University of Chicago, 1982
- [6] CNA, Study 1176, *Balancing Accession and Retention*, by Deborah Clay-Mendez et al., Sep 1982

APPENDIX A
INDEX TO COMPOSITE SCORES AND
PROBABILITIES OF QUALIFICATION

APPENDIX A

INDEX TO COMPOSITE SCORES AND PROBABILITIES OF QUALIFICATION

This appendix displays the composite scores used by the Navy in determining A-school qualifications. In all there are 26 combinations of the 10 basic composites shown in table A-1. Table A-2 gives the composite, minimum qualifying score, and probability of qualification, given mental group, for each of the 26 combinations, or rating groups. For example, seven rating groups use the composite C1 with minimum cutoff scores varying between 89 and 113.

TABLE A-1

COMPOSITION OF ASVAB COMPOSITES

Composite	ASVAB tests
C1	VE + AR
C2	AR + 2MK + GS
C3	AR + MK + EI + GS
C4	AR + MC + AS
C5	VE + MC + AS
C6	MK + AS
C7	VE + NO + CS
C8	VE + AR + NO + CS
C9	VE + MK + GS
C10	MK + EI + GS + AR

VE = Verbal
AR = Arithmetic Reasoning
MK = Math Knowledge
GS = General Science
CS = Coding Speed
NO = Numerical Operations
AS = Auto-Shop
MC = Mechanical Comprehension
EI = Electronic Information

TABLE A-2

PROBABILITY OF QUALIFICATION, GIVEN MENTAL GROUP

Rating group	Composite	Minimum score	Mental-group categories			
			I/II	IIIU	IIIL	IVA
1	C1	89	1.000	1.000	0.959	0.379
2	C1	90	1.000	1.000	0.935	0.307
3	C1	96	1.000	1.000	0.677	0.020
4	C1	97	1.000	0.995	0.615	0.015
5	C1	103	1.000	0.841	0.149	0.000
6	C1	108	0.967	0.389	0.019	0.000
7	C1	113	0.815	0.116	0.000	0.000
8	C2	196	0.984	0.812	0.348	0.041
9	C2	206	0.945	0.614	0.162	0.002
10	C3	190	0.998	0.964	0.717	0.260
11	C3	200	0.989	0.851	0.457	0.091
12	C3	204	0.981	0.775	0.333	0.054
13	C3	207	0.971	0.726	0.241	0.035
14	C4	161	0.919	0.710	0.427	0.189
15	C4	167	0.864	0.571	0.293	0.081
16	C5	155	0.947	0.832	0.628	0.311
17	C5	163	0.874	0.662	0.457	0.180
18	C5	173	0.698	0.597	0.218	0.042
19	C6	98	0.985	0.919	0.710	0.393
20	C7	144	0.982	0.866	0.581	0.133
21	C7	160	0.773	0.273	0.093	0.007
22	C8	202	0.990	0.776	0.199	0.007
23	C9	141	1.000	0.942	0.742	0.231
24	C10 ^a	218	0.964	0.653	0.257	0.004
25	NF ^b		0.761	0.076	0.000	0.000
26	Gendet		1.000	1.000	1.000	1.000

a $MK + EI + GS$ must equal at least 156; with the addition of AR , the total must sum to 218.

b The requirements for nuclear field are as follows:

$C1 \geq 113$

$C2 \geq 200$

$C6 \geq 98$

$C10 \geq 218$; see note a.

APPENDIX B

RECRUIT-QUALITY SIMULATION PROGRAM (FORTRAN)

APPENDIX B

RECRUIT-QUALITY SIMULATION PROGRAM (FORTRAN)

This appendix contains the detailed listing of the FORTRAN coding used in the Recruit Quality Goal Simulation Model.¹ The program is designed to run on the VAX version 4.1; some modifications may be required if a different computer system is used.

1. The programming detailed in this appendix was done by George Corliss of the Center for Naval Analyses.

RECRUIT QUALITY SIMULATION PROGRAM (FORTRAN)

IMPLICIT NONE

```

REAL PCT12(26), PCT3L(26), PCT3U(26), PCT4(26), SUM,
*   UMG PCT, FIXPCT, X, R, RU, RL, GGUBFS, DOM, PCT12T,
*   PCT3UT, PCT3LT, TIME, SSEATS, P12, P3U, P3L, P4, PCT4T

```

DOUBLE PRECISION SEED(10)

```

INTEGER NOSEATS(26), CLASSCNT(26), CCNT12(26),
*   CCNT3L(26), I1, I2, I3, K, UMG, NOTQ, NR, SUMT,
*   LOSS, TOT, SUMQ, COLL, M, N, SEEDI1(10),
*   SEEDI2(10), SEEDI3(10), LO12, LO3U, LO3L, LO4,
*   NEWCNT(26), C2, C1, NUM, NEW2(26), SUB4(26),
*   SUB3L(26), SUB3U(26), SUB12(26), CCNT4(26),
*   I4, I5, SUM12, SUM3L, SUM3U, SUM4, CCNT3U(26),
*   LMG3L, LMG4, LOSS88

```

```

DATA PCT12/1.00, 1.00, 1.00, 1.00, 1.00, 0.967, 0.815,
*   0.984, 0.945, 0.998, 0.989, 0.981, 0.971,
*   0.919, 0.864, 0.947, 0.874, 0.698, 0.985,
*   0.982, 0.773, 0.990, 1.000, 0.964, 0.761,
*   1.000/

```

```

DATA PCT3U/1.000, 1.000, 1.000, 0.999, 0.841, 0.389,
*   0.116, 0.812, 0.614, 0.964, 0.851, 0.775,
*   0.726, 0.710, 0.571, 0.832, 0.662, 0.597,
*   0.919, 0.866, 0.273, 0.776, 0.942, 0.653,
*   0.076, 1.000/

```

```

DATA PCT3L/0.959, 0.935, 0.677, 0.615, 0.149, 0.019,
*   0.000, 0.348, 0.162, 0.717, 0.457, 0.333,
*   0.241, 0.427, 0.293, 0.628, 0.457, 0.218,
*   0.710, 0.581, 0.093, 0.199, 0.742, 0.257,
*   0.000, 1.000/

```

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DATA PCT4/0.379, 0.307, 0.020, 0.015, 0.000, 0.000,
*   0.000, 0.041, 0.002, 0.260, 0.091, 0.054,
*   0.035, 0.189, 0.081, 0.311, 0.180, 0.042,
*   0.393, 0.133, 0.007, 0.007, 0.231, 0.004,
*   0.000, 1.000/

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DATA SEED/2116429302D0, 683743814D0, 964393174D0,
*   1217426631D0, 618433579D0, 1157240309D0,
*   15726055D0, 48108509D0, 1297920909D0,
*   477424540D0/

```

```

DATA NOSEATS/2246, 719, 1012, 705, 5964, 927, 133, 2967,
*   225, 2518, 1323, 2045, 124, 205, 1791, 1063,
*   2569, 122, 3705, 2997, 1116, 344, 4238,
*   15203, 7323, 12166/

```



```

DATA SUB12/18,25,21,7,15,17,14,9,16,24,6,13,12,20,
*      8,19,11,22,10,23,5,4,3,2,1,26/

DATA SUB3U/25,7,21,6,15,18,9,24,17,14,13,12,22,8,
*      16,5,11,20,19,23,10,4,3,2,1,26/

DATA SUB3L/25,7,6,21,5,9,22,18,13,24,15,12,8,14,
*      17,11,20,4,16,3,19,10,23,2,1,26/

DATA SUB4/25,7,6,5,9,24,22,21,4,3,13,8,18,12,15,
*      11,20,17,14,23,10,2,16,1,19,26/

DATA SEEDI1/1,2,3,4,5,6,7,8,9,10/
DATA SEEDI2/2,3,4,5,6,7,8,9,10,1/
DATA SEEDI3/3,4,5,6,7,8,9,10,1,2/

```

C
C

```

10  WRITE (6,10)
    FORMAT ('1', '***** INPUT THE UMG GOAL *****')
    READ (5,*) FIXPCT

20  WRITE (6,20)
    FORMAT ('0', '***** INPUT SEED TO USE FOR TEST *****')
    READ (5,*) I1
    WRITE (6,30)

30  FORMAT ('0', '***** INPUT SEED TO USE FOR I/II *****')
    READ (5,*) I2
    WRITE (6,40)

40  FORMAT ('0', '***** INPUT SEED TO USE FOR IIIU *****')
    READ (5,*) I3
    WRITE (6,45)

45  FORMAT ('0', '***** INPUT SEED TO USE FOR IIIL *****')
    READ (5,*) I4
    WRITE (6,50)

50  FORMAT ('0', '***** INPUT SEED TO USE FOR IV *****')
    READ (5,*) I5

    COLL = 0
    SUM = 0.0
    TOT = 0
    LOSS = 0
    LO4 = 0
    LO3L = 0
    LO3U = 0
    LO12 = 0
    NOTQ = 0
    SSEATS = 0.0

    DO 88 K=1,26
    CLASSCNT(K) = 0
    CCNT4(K) = 0
    CCNT3U(K) = 0
    CCNT3L(K) = 0

```

```

88      CCNT12(K) = 0
100     CONTINUE
        TOT = TOT + 1
        X = GGUBFS (SEED(I1))

        IF (X .LE. 0.308) THEN
            RU = GGUBFS (SEED(I2))
            CALL MG(CLASSCNT, PCT12, NOSEATS, CCNT12, RU,
                *      SUM, UMG, LO12, SUB12)
            *      UMG PCT = UMG/SUM
        ELSE
            IF (X .LE. 0.572) THEN
                RL = GGUBFS (SEED(I3))
                CALL MG(CLASSCNT, PCT3U, NOSEATS,
                    *      CCNT3U, RL, SUM, UMG, LO3U,
                    *      SUB3U)
                UMG PCT = UMG/SUM
            ELSE
                IF (X .LE. 0.838) THEN
                    IF (FIXPCT .LT. UMG PCT) THEN
                        RL = GGUBFS (SEED(I4))
                        CALL MG(CLASSCNT, PCT3L,
                            *      NOSEATS, CCNT3L,
                            *      RL, SUM, LMG3L,
                            *      LO3L, SUB3L)
                        ELSE
                            LOSS = LOSS + 1
                        END IF
                    ELSE
                        IF (FIXPCT .LT. UMG PCT) THEN
                            IF (LMG4 .LT. 8800) THEN
                                RL = GGUBFS (SEED(I5))
                                CALL MG(CLASSCNT, PCT4,
                                    *      NOSEATS, CCNT4, RL,
                                    *      SUM, LMG4, LO4, SUB4)
                                ELSE
                                    LOSS88 = LOSS88 + 1
                                END IF
                            ELSE
                                LOSS = LOSS + 1
                            END IF
                        END IF
                    END IF
                END IF
            END IF
        END IF

125     IF (SUM .LT. 73750 .AND. TOT .LT. 100000) GOTO 100
155     CONTINUE

        WRITE (6,130) FIXPCT, I1, I2, I3, I4, I5
130     FORMAT('1', //, ' **  FIXED PCT. = ', F4.3,
        *      ' TEST SEED = ', I2, ' I/II SEED = ', I2,
        *      ' IIIU SEED = ', I2, ' IIII SEED = ', I2,

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```

      *          IV SEED = ',I2)

      WRITE (6,150)
150  FORMAT('0',16X,' I/II',5X,' IIIU',5X,' IIIIL',5X,
      *      'IV',5X,' TOTAL',5X,' QUOTA',2X,' PCT I-III',2X,
      *      ' PCT IIIU',2X,' PCT IIIIL',2X,' PCT IV')

      SUMT = 0
      SUM12 = 0
      SUM3U = 0
      SUM3L = 0
      SUM4 = 0
      SUMQ = 0

      DO 200 K=1,26

      SUMT = SUMT + CLASSCNT(K)
      SUM12 = SUM12 + CCNT12(K)
      SUM3U = SUM3U + CCNT3U(K)
      SUM3L = SUM3L + CCNT3L(K)
      SUM4 = SUM4 + CCNT4(K)
      SUMQ = SUMQ + NOSEATS(K)

      DOM = CLASSCNT(K)

      IF (DOM .GT. 0) THEN
          P12 = CCNT12(K)/DOM
          P3U = CCNT3U(K)/DOM
          P3L = CCNT3L(K)/DOM
          P4 = CCNT4(K)/DOM
      END IF

      WRITE (6,300) K,CCNT12(K),CCNT3U(K),CCNT3L(K),
      *      CCNT4(K),CLASSCNT(K),NOSEATS(K),
      *      P12,P3U,P3L,P4
300  FORMAT (1X,'CLASS = ',I2,6(5X,I5),4(5X,F5.3))

      200  CONTINUE

      DOM = SUMT

      IF (DOM .GT. 0) THEN
          PCT12T = SUM12/DOM
          PCT3UT = SUM3U/DOM
          PCT3LT = SUM3L/DOM
          PCT4T = SUM4/DOM
      END IF

      WRITE (6,400) SUM12,SUM3U,SUM3L,SUM4,SUMT,SUMQ,
      *      PCT12T,PCT3UT,PCT3LT,PCT4T
400  FORMAT ('0', 'TOTAL = ',6(4X,I6),4(5X,F5.3))

      WRITE (6,550) LOSS
550  FORMAT ('0', 'NO. OF PEOPLE LOST DUE TO FIXED
      *      PERCENT = ',I7)

```

```

WRITE (6,553) LOSS88
553 *   FORMAT ('0', 'NO. OF IV'S LOST DUE TO 8800
      *         LEVEL = ', I7)

WRITE (6,555) LO12
555 *   FORMAT('0', 'NO. OF I-II PEOPLE LOST (NOT Q OR
      *         FULL CLASS) = ', I7)

WRITE (6,557) LO3U
557 *   FORMAT('0', 'NO. OF IIIU PEOPLE LOST (NOT Q OR
      *         FULL CLASS) = ', I7)

WRITE (6,558) LO3L
558 *   FORMAT('0', 'NO. OF III L PEOPLE LOST (NOT Q OR
      *         FULL CLASS) = ', I7)

WRITE (6,559) LO4
559 *   FORMAT('0', 'NO. OF IV PEOPLE LOST (NOT Q OR
      *         FULL CLASS) = ', I7)

WRITE (6,560) TOT
560 *   FORMAT ('0', 'NUMBER OF RECRUITS CONTACTED = ',
      *         I7//)

STOP
END

```


APPENDIX C
SIMULATION MODEL OUTPUT

APPENDIX C

SIMULATION MODEL OUTPUT

Tables C-1 and C-2 show output from the simulation model using upper-mental-group goals of 57 and 59 percent respectively. The composite scores shown correspond to the listing of conditional probabilities given in appendix A. The population of potential recruits used in these examples is the population detailed in table 1 of the main text.

TABLE C-1

SAMPLE OUTPUT
UMG Goal = .57

CLASS	I/II	IIIU	IIIL	IVA	TOTAL	QUOTA	I/II	IIIU	IIIL	IVA
1	0	0	1747	499	2246	2246	0.000	0.000	0.778	0.222
2	0	0	634	85	719	719	0.000	0.000	0.882	0.118
3	0	141	808	63	1012	1012	0.000	0.139	0.798	0.062
4	0	331	335	39	705	705	0.000	0.470	0.475	0.055
5	261	3209	2494	0	5964	5964	0.044	0.538	0.418	0.000
6	23	786	118	0	927	927	0.025	0.848	0.127	0.000
7	76	57	0	0	133	133	0.571	0.429	0.000	0.000
8	463	1643	691	170	2967	2967	0.156	0.554	0.233	0.057
9	112	89	22	2	225	225	0.498	0.396	0.098	0.009
10	1235	380	642	261	2518	2518	0.490	0.151	0.255	0.104
11	75	177	793	278	1323	1323	0.057	0.134	0.599	0.210
12	201	1132	625	87	2045	2045	0.098	0.554	0.306	0.043
13	4	40	69	11	124	124	0.032	0.323	0.556	0.089
14	63	49	88	5	205	205	0.307	0.239	0.429	0.024
15	493	1027	183	88	1791	1791	0.275	0.573	0.102	0.049
16	597	174	116	176	1063	1063	0.562	0.164	0.109	0.166
17	1420	80	840	229	2569	2569	0.553	0.031	0.327	0.089
18	115	6	1	0	122	122	0.943	0.049	0.008	0.000
19	1102	881	1348	374	3705	3705	0.297	0.238	0.364	0.101
20	424	227	1955	391	2997	2997	0.141	0.076	0.652	0.130
21	71	726	319	0	1116	1116	0.064	0.651	0.286	0.000
22	10	9	315	10	344	344	0.029	0.026	0.916	0.029
23	1723	607	1275	633	4238	4238	0.407	0.143	0.301	0.149
24	7367	6585	1222	29	15203	15203	0.485	0.433	0.080	0.002
25	6727	596	0	0	7323	7323	0.919	0.081	0.000	0.000
26	1366	1536	3894	5370	12166	12166	0.112	0.126	0.320	0.441
TOT	23928	20488	20534	8800	73750	73750	0.324	0.278	0.278	0.119

NO. OF PEOPLE LOST DUE TO UMG GOAL	128
NO. OF IV'S LOST DUE TO CAP OF 8800	3623
NO. OF I/II PEOPLE LOST (NOT QUALIFIED OR FULL CLASS)	0
NO. OF IIIU PEOPLE LOST (NOT QUALIFIED OR FULL CLASS)	0
NO. OF IIIL PEOPLE LOST (NOT QUALIFIED OR FULL CLASS)	0
NO. OF IV PEOPLE LOST (NOT QUALIFIED OR FULL CLASS)	0
NUMBER OF RECRUITS CONTACTED	77501

TABLE C-2

SAMPLE OUTPUT
UMG Goal = .59

CLASS	I/II	IIIU	IIIL	IVA	TOTAL	QUOTA	I/II	IIIU	IIIL	IV
1	0	0	1740	506	2246	2246	0.000	0.000	0.775	0.225
2	0	0	634	85	719	719	0.000	0.000	0.882	0.118
3	0	149	802	61	1012	1012	0.000	0.147	0.792	0.060
4	0	342	325	38	705	705	0.000	0.485	0.461	0.054
5	314	3244	2406	0	5964	5964	0.053	0.544	0.403	0.000
6	23	789	115	0	927	927	0.025	0.851	0.124	0.000
7	76	57	0	0	133	133	0.571	0.429	0.000	0.000
8	441	1706	646	174	2967	2967	0.149	0.575	0.218	0.059
9	113	89	21	2	225	225	0.502	0.396	0.093	0.009
10	1240	386	631	261	2518	2518	0.492	0.153	0.251	0.104
11	79	180	771	293	1323	1323	0.060	0.136	0.583	0.221
12	208	1154	601	82	2045	2045	0.102	0.564	0.294	0.040
13	4	40	69	11	124	124	0.032	0.323	0.556	0.089
14	63	54	84	4	205	205	0.307	0.263	0.410	0.020
15	496	1044	173	78	1791	1791	0.277	0.583	0.097	0.044
16	614	175	111	163	1063	1063	0.578	0.165	0.104	0.153
17	1477	82	793	217	2569	2569	0.575	0.032	0.309	0.084
18	115	6	1	0	122	122	0.943	0.049	0.008	0.000
19	1146	892	1287	380	3705	3705	0.309	0.241	0.347	0.103
20	516	232	1858	391	2997	2997	0.172	0.077	0.620	0.130
21	71	740	305	0	1116	1116	0.064	0.663	0.273	0.000
22	10	9	315	10	344	344	0.029	0.026	0.916	0.029
23	1718	610	1264	646	4238	4238	0.405	0.144	0.298	0.152
24	7409	6631	1135	28	15203	15203	0.487	0.436	0.075	0.002
25	6727	596	0	0	7323	7323	0.919	0.081	0.000	0.000
26	1420	1622	3754	5370	12166	12166	0.117	0.133	0.309	0.441
TOT	24280	20829	19841	8800	73750	73750	0.329	0.282	0.269	0.119

NO. OF PEOPLE LOST DUE TO UMG GOAL	1722
NO. OF IV'S LOST DUE TO CAP OF 8800	3207
NO. OF I/II PEOPLE LOST (NOT QUALIFIED OR FULL CLASS)	0
NO. OF IIIU PEOPLE LOST (NOT QUALIFIED OR FULL CLASS)	0
NO. OF IIIL PEOPLE LOST (NOT QUALIFIED OR FULL CLASS)	0
NO. OF IV PEOPLE LOST (NOT QUALIFIED OR FULL CLASS)	0
NUMBER OF RECRUITS CONTACTED	78679

END

DTIC

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